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MODEL AIRPLANE NEWS

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MARCH 1956 Vol. LIV—No. 3

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M. A. N. AT WORK

by William Winter

► It has long been our contention that free flight is in a rut; that power loading should have been increased years ago to bring out refinement in airplane design; that the emphasis has been on adjustment more than on design; that free flight is no more scientific than combat (a wee exaggeration). Don Alberts, the Senior National Champion and free flight specialist, dissents. Since Don undoubtedly speaks well for the contest boys, who like things the way they are, and this being mid-December as we write, MAN at Work is going Christmas shopping while Don speaks his piece. Here he is:

"While controlline appeals to many who want something to occupy their spare time," Don begins, "it is apparent that, with a handful of notable exceptions, it is in a lower stage of development than free flight. Perhaps this is not so apparent in the East because of a lack of facilities which tends to hold the quality of both types of flying below the levels in other parts of the country. In the West, however, we are largely unhampered with respect to space and have no desire to suffer the consequences of rules designed to please only the subway riders."

Don goes on to say that the majority of active free flighters are quite happy, that we apparently don't know that, and that, in his words, "model competition is a sport rather than a science and that if the experimenters want to hold novelty and fun events, they should do so with complete freedom."

Professing complete amazement over the "pseudo fact" that free flight is in a rut and doesn't prove anything, Don adds that we should not express such "sectional and prejudiced views where children and those of lower mentality might see them and be affected." He compares the purpose of the super-hot free flight to the European Grand Prix racing by way of refuting our statement that free flight proves nothing, presumably, as he puts it, "because all planes have one wing and a motor."

"As for higher power loadings," Alberts declares, "the only ones who are universally for this abortive rule are those who are unable to build a light model and live in anticipation of legislating themselves into the winners' circle. The poor showing of PAA-Load events eloquently declares how contest fliers regard high loadings."

Don, we know how you feel. Had our say and now (Continued on page 6)

NEXT MONTH'S COVER
Convair TF-102A

PLANE ON THE COVER

Bright spot in the past of civil aviation in America was the immortal Travelair biplanes introduced in the mid-'twenties. The Curtiss OX-5 90-hp engine was fitted in first 31½ ft. job shown. Firm was headed by Clyde Cessna. Walter Beech was vice president and Lloyd Stearman, chief designer. Wichita, the factory site, was air capital of the U.S.


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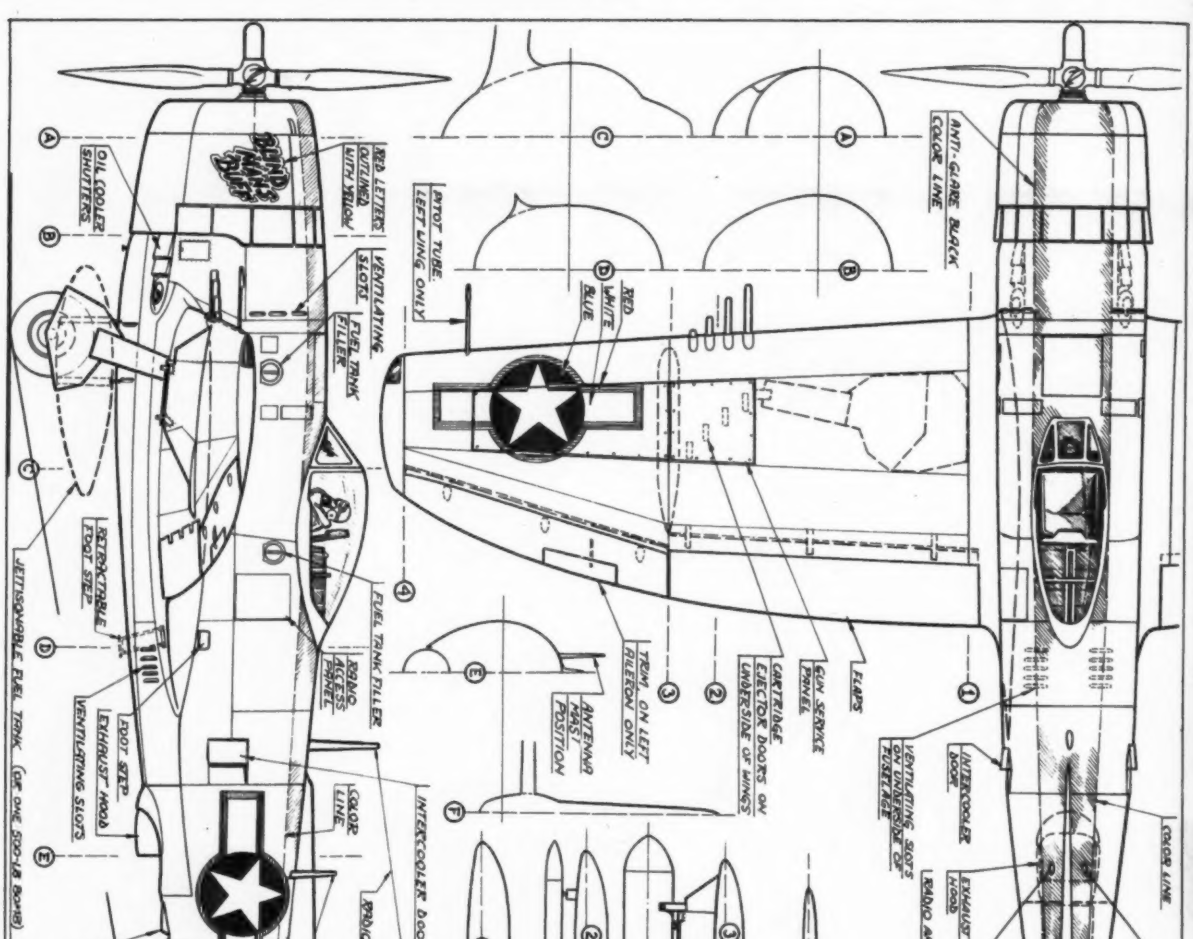
Planes Worth Modeling—REPUBLIC P-47N THUNDERBOLT



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MAN at Work

(*Continued from page* 2)

you've had yours. But somehow all this reminds us of the New Yorker at a Plymouth Internats who challenged any five combat fliers in the joint to a go-round. Five against one. So after the PA system built up interest and everyone was popping gussets, the six crates took off. Our boy half-looped back against traffic and all six collided. Even the ghouls who hang around the combat boys hoping for the worse were awed by that one. Yes, sir! This debate has the makings. All welcome.

• • •

► One of the great clubs of all time was the Brainbusters (who literally were) of Langley Field, Va. In the days of yore, this outfit had national influence. Remember the 1939 AMA Convention? That was the year when the country was split wide open over free flight rules. To smooth the way, the 'Busters had the mob down to Hampton. Can still see that Southern boy—who was he?—on the wee hours filibuster. Embattled Carl Goldberg vainly arguing about something or other. Herb Weiss and someone now forgotten demonstrating a new indoor model which used positively and negatively-charged wing edges instead of microfilm, the flow of electrons keeping the ship in the air. Everyone at the banquet believed it until the model was launched. It fell on the floor. Silence. Then the uproar. Well, the Brainbusters are back. Brainbusters International Group (BIG), with Frank Parmenter, president; Woody Blanchard, vice president; John Worth, secretary. Purpose is to exchange information and ideas to increase the proficiency of interested local modelers in FAI, Wakefield and Nordic.

Worth, Bob Champine (top man on '55 Wakefield team), Shoaf and Parmenter spark a research program involving multiple flash pix of a Wakefield in the glide. Shoaf is building a decent low speed wind tunnel, working closely with NACA tunnel engineers. BIG is pushing for a new system for picking team members for future International events. Chicago's Pete Sotich is their choice to head up the deal. Pete, it will be remembered, performed impressively in handling the American-sponsored (U.S.A. having been the 1954 winner) 1955 events in Germany last summer. Correspondence should be addressed to John Worth of Control Research, P.O. Box 9, Hampton, Va.

• • •

► Here at MAN, 1955 was significant for the large influx of letter writing from 12 to 14-year-olds and for the long lost pappy guys who are making a bewildered reentry into the model airplane hobby, often to enthuse Junior with the proposition that cementing sticks together can be fun. Both groups have something in common. They need info fast. It has become impossible to keep up with the flood of questions. So we've persuaded the Academy of Model Aeronautics to announce that the second printing of the 1955-56 Official Model Aircraft Regulations, a 36-page job, is available by sending 10c in coin to AMA Headquarters, 1025 Connecticut Ave., N.W., Washington 6, D.C. Rules and regulations governing the specifications and operation of numerous kinds of models are herein outlined. If you want an outline of the competitive field, do get the booklet and, if you still have questions, we'll do our durndest.

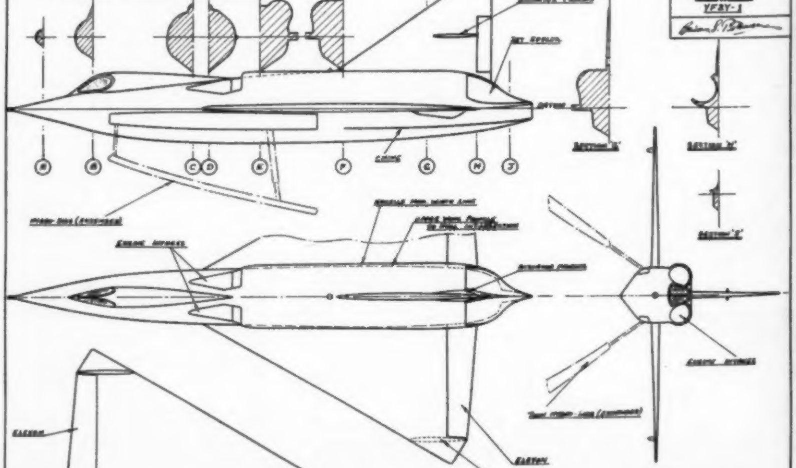
• • •

► As we go to press, George Gardner, Superintendent of Educational Services for Pan American World Airways System and team mate of Dallas Sherman on the PAA-Load project, tells us that a special, experimental Jetex PAA-Load contest will be held at the King Orange Internationals, December 30 and January 1; Miami, where else? It so happens (of course!) that we have before us a copy of the rules. High points are Jetex 150 powerplant; greatest over-all dimensions, 36 in.; weight all up, 5 oz. minimum; 1 oz. dummy: 1 in. square, ⅛ in. thick, with ⅛ in. cube for a haid. Two flights: one ROG, t'other, HL. Five attempts in all and total flight time. The type of powerplant may be less limited sometime in the future, but if you puzzle this out, you'll see why it will prove tough to match evenly powerplants that meet a propellerless specification.

• • •

► Among this month's visitors was Frank "Big Stoop" Garcher, the Midwest man. Frank and Wally Simmers were inseparable at many Nationals, going back before the war. Simmers designed a whole string of very excellent fliers which, as kits, de-

(*Continued on page* 35)



SKYRAIDER...

By J. KELLY ABBOTT—AMC, USN

Built around the .19, rather than the bigger .29's, this Douglas AD-1 follows authentic plans. It's light; a proven performer.

Known for his beautiful scale and Carrier event jobs, Abbott has plenty of first-hand opportunity to observe and duplicate the real craft upon which they are based.

► Many Skyraider models have been built and flown in the past two or three years, but, in most instances, they were designed for the Class C and D engines. Having built several models of the large variety previously, the writer decided to try one employing a Cameron .19 engine for power. An Enya .19-powered model performed equally well, having the same flight characteristics, although the Enya was much heavier.

This model was scaled from authentic drawings of the full sized aircraft with very few changes. For instance, the airfoil section at the wing root was flattened out from the main spar aft to the TE to aid in setting up construction on a flat surface. The built-in variable incidence in the wing was retained for stability at slow speeds used in the Carrier event. Other deviations were the elimination of engine downthrust and addition of about ⅛ in. to the TE of the elevators for more positive control. This model was designed with the following points in mind: simplicity of construction, ruggedness, and conservation of weight. It has a wingspan of 33 in., a flying weight of approximately 1 lb. 10 oz. and a top speed of 38 mph on 50 ft. lines.

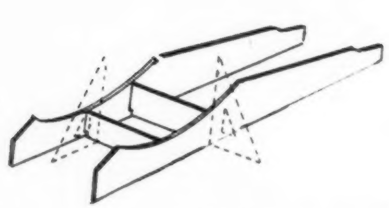
The model retains many of the flight characteristics of the actual airplane, the most noticeable one being that it flies with a tail-high attitude in full-powered level flight. For smooth take-off the control is held in neutral. It handles well in low-powered conditions and will glide to a smooth landing with no power by holding the nose down slightly.

In general this model is of conventional construction and should not prove too complicated for the average modeler.

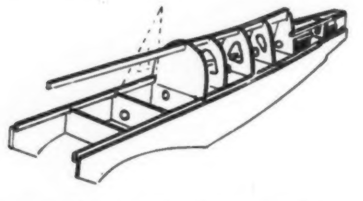
The wing is built with two parallel spars and the two halves of the wing are connected by spar joiners which extend from rib No. 4 on one side to rib No. 4 on the opposite side. The spars are full depth and notched to receive each rib. The forward spar is cut from ⅛ in. and the rear spar from 3/32 in. medium or hard balsa as are the corresponding spar joiners. The ribs are of 3/32 in. medium balsa and the wing covering (skin) is 1/16 in. sheet balsa, installed in three sections, top and bottom.

The spar halves are attached to the plan view of the wing on a flat working surface. Block up the tip ends 3/32 in. to clear the lower curve of the outboard ribs. Cement two No. 1 ribs together and insert into No. 1 slots in spars with flat lower edge against the working surface. Progressing outboard, install remaining ribs, carefully alining the lower edge of each rib with the lower edge of both spars. This should be easily accomplished if notches have been carefully cut. Note that the forward portions of rib No.'s 2 and 3 are installed at an angle and are left out until after ⅛ in. balsa LE strip is in place.

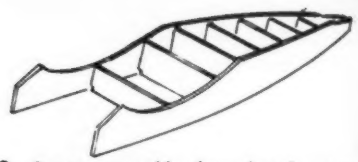
After all ribs have been cemented into place, cut LE strip and install along flat nose of ribs and insert forward portions of rib No.'s 2 and 3. The next step is to cover the upper surface of the wing from the TE to the center line of the forward spar while the assembly is still attached to the working surface, to maintain alinement. This portion of the covering is done in two sections, one from the TE to the rear spar and the other from the rear to the forward spar. Leave the forward portion uncovered until the landing gear



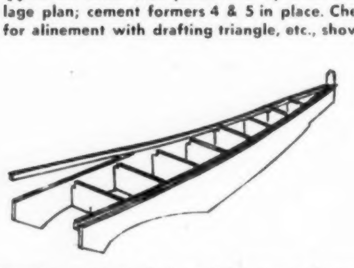
1. Invert lower side panels on top view fuselage plan; cement formers 4 & 5 in place. Check for alinement with drafting triangle, etc., shown.



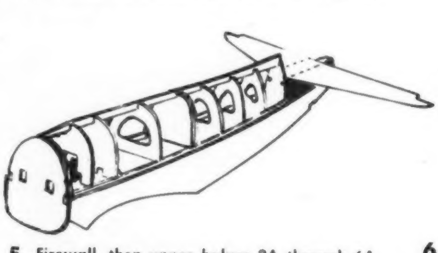
2. Assembly is continued by cementing the lower halves of formers 6 through 12 in place. Again check alinement with plans for accuracy.



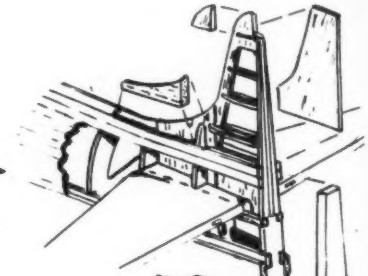
3. Remove assembly from board, cement doubler strip shown in place. Finally, cement tail former No. 12 position. Note notches.



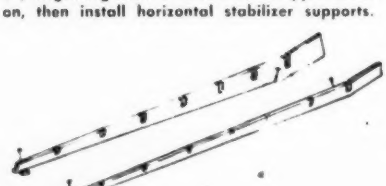
4. Follow with top halves of formers 6 through 11, beginning with 6 & 10. Place upper keels on, then install horizontal stabilizer supports.



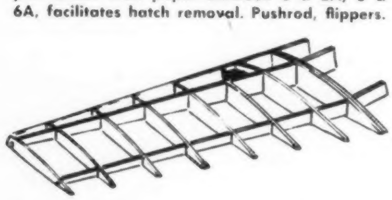
5. Firewall, then upper halves 2A through 6A, positioned. Wax paper between 2 & 2A; 6 & 6A, facilitates hatch removal. Pushrod, flippers.



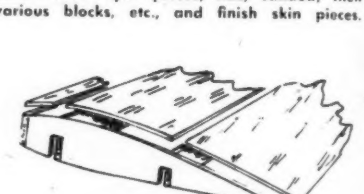
6. Two butt-jointed fin center pieces installed, then vertical spar pieces; ribs, sanded; then various blocks, etc., and finish skin pieces.



7. Wing assembly begun by fastening spars over wing plan, blocking up tips 1/16 in. as shown. Note rib notches that are cut in spars.

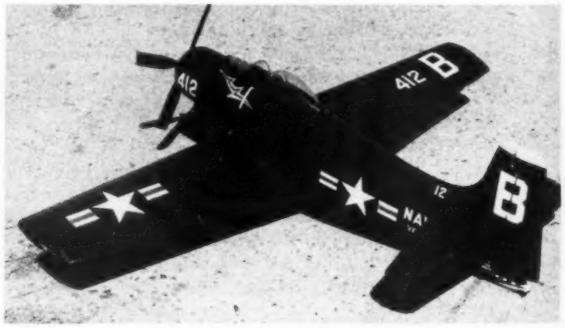


8. Cement ribs 1 & 8 in place. When dry, add the remaining ribs and finally install the leading edge cap strip shown. Wing light, strong.



9. Before removing wing panel from plan, install three top balsa skin pieces, using spars for dividing lines. Add spar joiners, sheet bottom.

Only the exposed head of the inverted engine differs from true scale. Landing gear, for example, is most realistic, but is durable in use.



Authentic markings, sliding bubble canopy. Carrier hook (and striped, too), four-bladed "fan," cowling cooling flaps typify fine details.

platforms have been installed. When cement has dried, remove wing halves from working surface and join together by slipping spar joiners into place from the bottom. Check for proper dihedral by measuring 1-13/16 in. from flat surface at tip rib on each wing tip.

After the two halves of the wing have been joined, the lower wing surface is covered from the TE to the forward spar in the same manner as the upper surface. The landing gear platform is built in next. It is cut from 3/32 in. plywood and has a nut plate either screwed or riveted to the upper surface. This plate is one of two types depending upon which type of landing gear strut is being installed. Plain flat nuts, soldered to a piece of brass or tin, may be substituted for the aviation-type anchor nut shown on the plans. The plywood platforms are then installed between the converging rib No.'s 2 and 3 and blocked in with strips of 3/32 in. balsa cemented into place on all sides on top and bottom of platform. It should be noted at this time that the forward spar joiner is notched at the bottom between rib No.'s 2 and 3 to form a socket for mounting landing gear anti-drag struts. Wire part of anti-drag strut is cemented to 3/32 in. dowel or swab stick and wrapped with thread. Then it is cemented into aforementioned slot using plenty of cement.

Tubular sections of anti-drag struts are then soldered to main strut at lower ends and wire fitting, just installed, at upper ends after main strut has been screwed into wing fitting. This method of landing gear construction may seem rather complicated but is actually easier to make and install than other types because it is rugged, removable for repair or replacement, and localizes damage. It affords better scale appearance.

When landing mounting platform has been installed, finish covering the forward portions of each wing and sand flush with ⅛ in. LE strip. Both wings are then capped off with a tapering ¼ in. thick (*Continued on page* 51)

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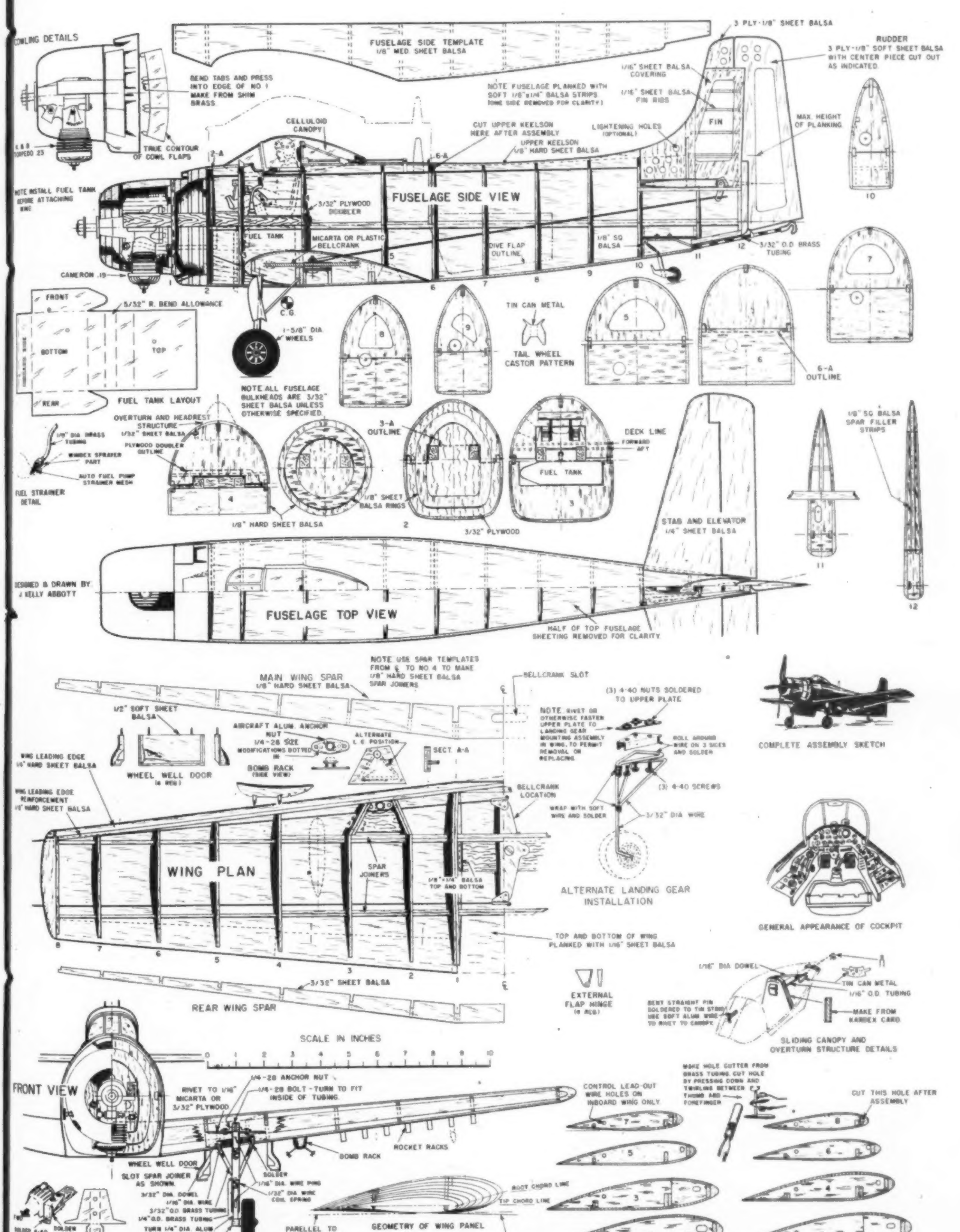


FULL SIZE PLANS AVAILABLE. SEE PAGE 54.

Bette Jane Knapping holds twin Fox .35 stunter; George Schowerer, W. Englewood, N.J. At Mirror.

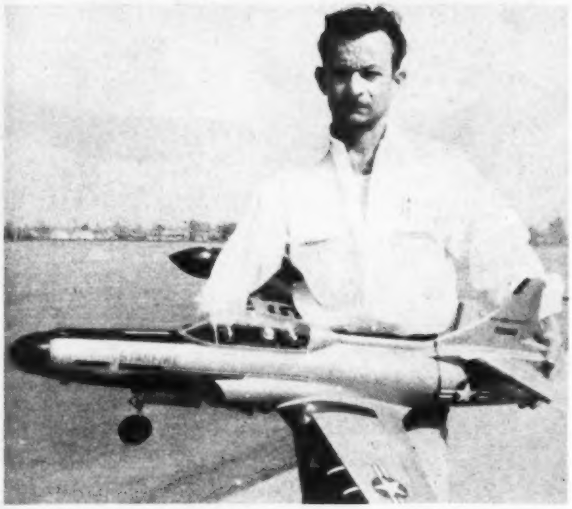
Double Jumping Jack, two Fox .35's, Eddie Fisher (no relation!), is fast, sounds impressive.

Stanley Steven launches Thermic 72, Linton Wollen. Taken by Jerome Heinsen at Bishop, Calif.

Beautiful Grumman F2F-2, Robert Haack, San Antonio, does outsides. inverted eights, on flat-bottom wing. Eek! Two pounds, 60 mph. Torp .32.

Dooling .29 speed job by James Larkin, Birmingham, Ala., good results with Plasticote 7 x 9, Supersonic 1000. Metal pan, wing, Sta finish.

Japanese models excel in numbers, variety, imagination. Big Globemaster from a Tachikawa c/l contest is typical. From Bunzo Yanagimachi.

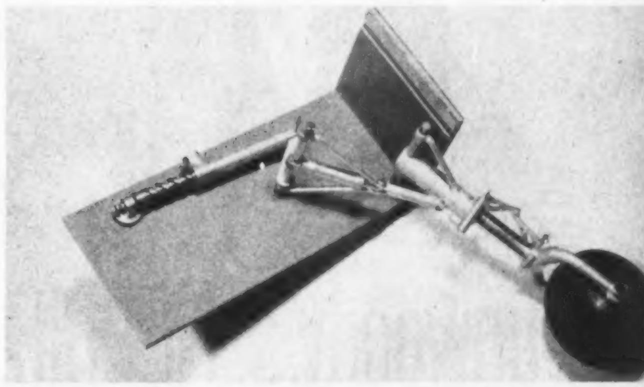


Dramatic Lockheed F-94C Starfire, enclosed Dyna-Jet for power, was made by Ralph Saldiver, Fresno. In inch-to-the-foot scale, it spans 37½ in.

Joe Nedela crewed the original of this ½-inch scale A-20 in the Pacific. With two Wasps, it has third line retractable gear, locking down.

Air Ways...

Free flight may be the king pin at the Nats but it's mostly the yo-yo builders who send in the pictures. How about that, you FF'ers?



Nedela's job is flying mock-up for ¾ in. scale by him and Ed Harp, photog. Nose gear, shown, machined, plated. Tire is specially molded!

Rich, of Rich's Hobbytowne, Rt. 46, Parsippany, N.J., flies Fox .35 Ringmaster with his Flyateers at demonstrations, also season Sunday shows.

Tying South African record of 138 mph, Hot Canary Jet, made by Keith Kayton, East London, S.A., who flew it. The photograph from J. Olivier.

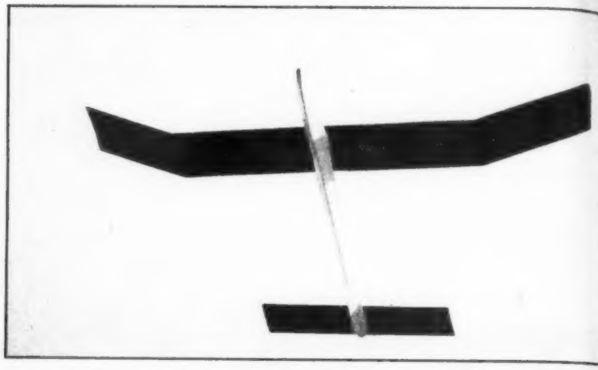
Stand-out consistency of author's favorite Nordic, here displayed, results from a great many things and is anything but a chunk of luck.

Dunwoody's NORDIC

By BILL DUNWOODY

It took 21 towline gliders to perfect this design. Racked up nine firsts at major contests.

Reliable adjustment for straight tow and desired glide turn is something that baffles many towline entrants. But no worries with this job.



In most sections of this country, ruggedness is essential, especially if the ship is flown frequently. No room for temperamental airplanes!

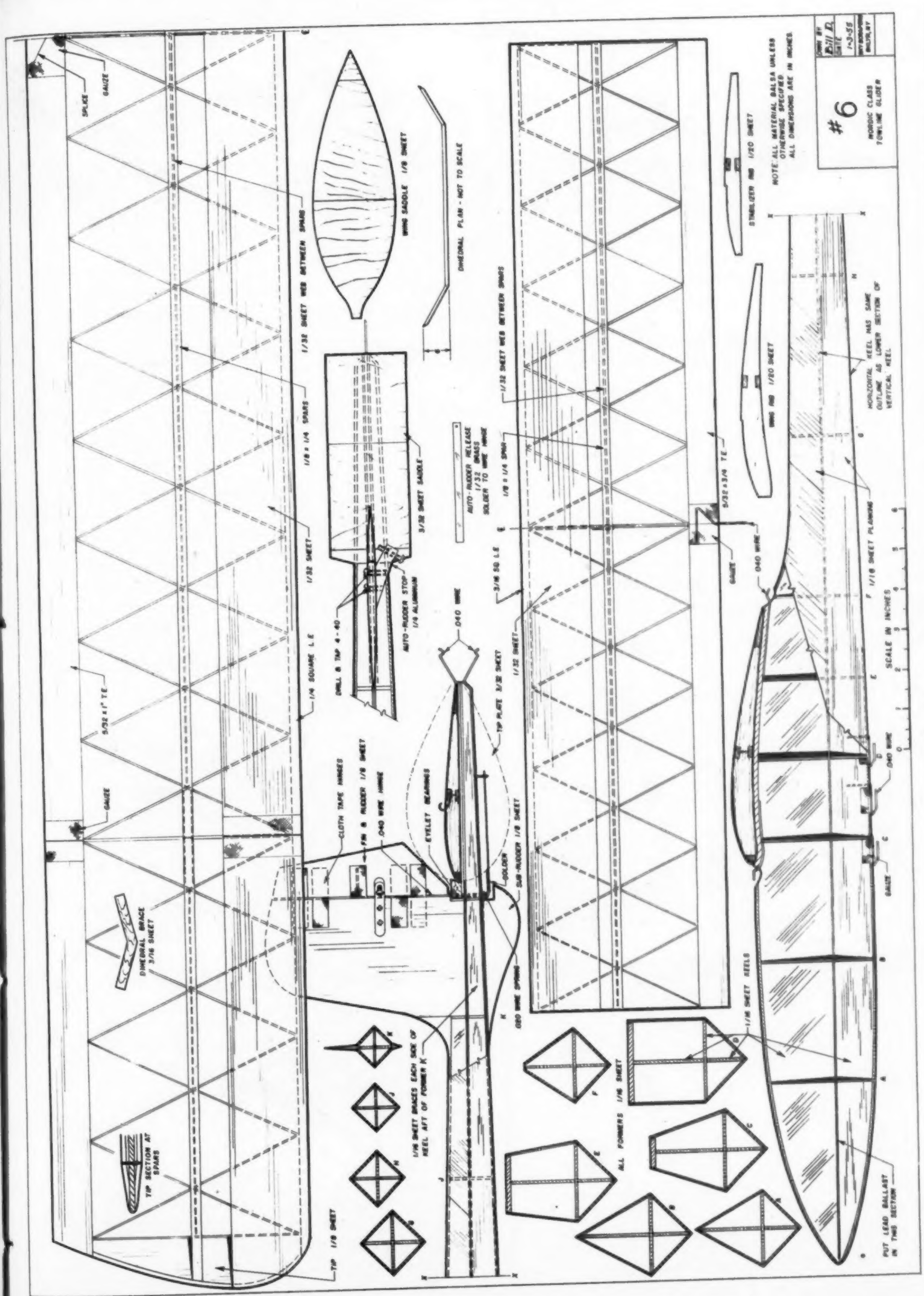
► This Nordic is the sixth design of a series of towline gliders designed and built in the past four years. In all, 21 models were built, eight of them Nordics, and the sixth incorporates the best featurs of all of them. To date, this model has won nine first places, three second places, two thirds and has placed fourth in both the 1953 and 1954 Nationals.

Construction is easy and only the auto-rudder should require any special attention. The semi-geodetic construction used on the wings and stabilizer is no more difficult than conventional construction and really pays off in warp-resistance and high impact strength. The I-beam spar is so strong that a 30 lb. test line was broken on the tow without folding the wings. The auto-rudder is foolproof and that is something that can be said of few auto-rudders. It affords independent adjustment of the rudder in both the tow and the glide.

Start construction with the stabilizer. Cut out three straight ribs, shown in the side view of the fuselage, and 24 diagonal ribs from 1/20 sheet balsa. Pin the LE, lower spar and TE onto the plan and slip the straight ribs and alternate diagonal ribs into place, cementing each joint well. Cut the remaining ribs in half between the spars, removing about 1/16 in. to allow for the ribs already in place. Cement these ribs in place, being careful to line them up straight. Now between the ribs, above the spar, to form the web of the I-beam, cement one piece of 1/32 x 2 in. balsa, 1-15/16 in. wide, and 12 cross-grain strips, ⅛ in. wide. The upper spar should now be fastened in place and the structure removed from the board when dry. Carve the LE to shape and cement the 1/32 in. sheeting in position. Bend the hooks to shape and cement them into place; cover with gauze and then recement every joint in the structure. Cover with Japanese tissue or Skysail and dope well.

This brings us to the wing, where construction procedure parallels that of the stabilizer. The center section is built first with the 3/16 in. dihedral gussets taking the place of the 1/32 in. sheet web at each end. When dry, the center section is raised at an angle to permit the tip panel to be built onto it—first one end, then the other. The straight ribs and tips are added and the sheeting put in place, starting at the center section. Be sure the spars are flush with the edges of the ribs for best results in covering. Gauze is cemented over the dihedral joints and all joints recemented. Cover with Japanese tissue or Skysail and dope well.

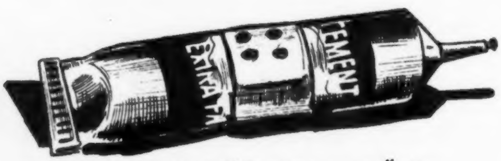
For the fuselage, start by cutting out the 1/16 in. crutch and keels. The lower fuselage keel is used as a pattern for the crutch. An additional section is spliced onto the crutch at the tail to give the full 41 in. length. The crutch should be fastened down flat and the upper keel and formers cemented into place. The wing saddle, fin and stabilizer saddle may be mounted now. When dry, the crutch may be raised from the board and the (*Continued on page* 47)



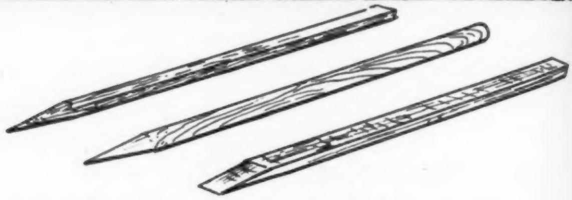
FULL SIZE PLANS AVAILABLE. SEE PAGE 54.

NEVER SQUEEZE A CEMENT TUBE IN THE MIDDLE! THE RESULTS CAN BE CATASTROPHIC! SEE SKETCH NO. 2 FOR CORRECT METHOD. ALWAYS REPLACE THE STOPPER IN THE SPOUT.

SQUEEZE TUBE FROM LOWER END ONLY. WHEN TUBE IS HALF EMPTY WORK REMAINING CEMENT TOWARDS SPOUT WITH A DOWEL OR SCREWDRIVER HANDLE.

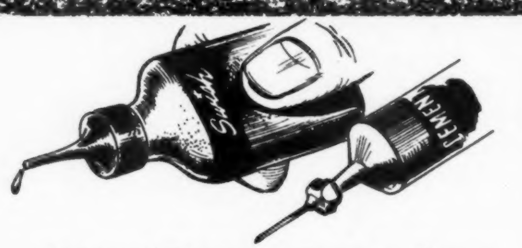


CEMENT TUBE "BLOWOUTS" ARE ANNOYING & COSTLY. A SIMPLE REPAIR MAY BE MADE BY WIPING PAINT OFF TUBE & APPLYING A "BAND AID." COAT WITH CEMENT & DRY.

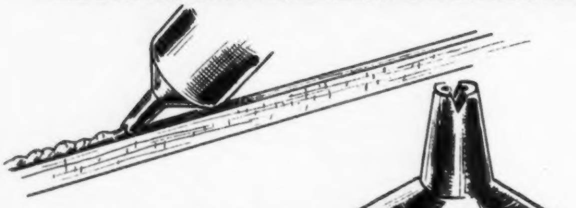


HARD BALSA STRIPS AND BIRCH DOWELS SHARPENED TO CHISEL POINTS ARE ESSENTIAL FOR NEAT WORK. KEEP SEVERAL OF EACH TYPE HANDY.

A HANDY HINT FOR ECONOMY- SQUEEZE SEVERAL TUBES OF CEMENT INTO SMALL BOTTLE WITH CORK STOPPER. PUSH SHARP DOWEL THRU CORK SO $\frac{1}{8}$ INCH IS IMMERSED IN CEMENT. AS THE CEMENT IS USED, PUSH DOWEL DEEPER AS REQUIRED....



PLASTIC "SQUEEZE BOTTLES" WITH "HYPO" TIPS OR A "HYPO TIP" OVER A CEMENT SPOUT ARE HANDY GADGETS. SOAK IN DOPE THINNER AFTER USING.



"VEE" NOTCH FILED IN END OF SPOUT WILL CONTROL FLOW OF CEMENT FOR THOSE TOUCHY EDGE-CEMENTING JOBS SUCH AS PLANKING.

"C" CLAMPS AND MOTOR MOUNT STOCK WORK WELL FOR SMALL LAMINATION JOBS. USE THRU BOLTS IF "C" CLAMPS NOT HANDY.

How to use  Cement

Pop dissolved snapshot negatives to make cement but we can even choose how fast we want our cement to dry.

There's a wrong and a right way to use cement—surprised?—but don't let it toss U. It's like this, says Harry.

By HARRY A. WILLIAMSON

ILLUSTRATED by ROBERT W. GODDEN

► Most of us go blissfully along our model building way, year after year, with scarcely a thought about the good fortune that is ours, in the excellent materials, readily available, that meet our exacting requirements.

Outstanding among the many products are the strong, fast-drying and flexible cements in their familiar tubes on the shelves of the local hobby shop. Without the advantages offered by these versatile cements, model building would be languishing in the Dark Ages. Can't you picture yourself trying to rush a ukie job into the air for next Sunday's clambake or trying to do some field repairs with one of the old-fashioned animal gelatin cements?

These cements (*cement*, son; never call it glue!) are loosely grouped under the heading of pyroxalin cements. The ingredients vary; nitrocellulose or cellulose acetate in solvents is common or solvents may be compounded from resins of various types and plasticized with gums or synthetics. In some cases, these cements are made by simply dissolving recovered motion picture film in solvents, retaining the original film plasticizers. This latter method, incidentally, is well known to the real old timers (those on the far side of 30) who frequently made nearly all theirs from old snapshot negatives. Regardless of the ingredients, however, these cements all dry the same way—by evaporation of the solvents. Since evaporation is the key to drying, it may be readily seen that the difference between slower and faster drying cements may be controlled by adding more or less retarder to the solvents or by varying the amount by volume.

In addition to rapid drying, these cements are characterized by their lack of initial "tack" (stickiness while wet) and their ability to adhere to almost any dry and grease-free surface, although they exert their maximum bonding strength (ca. 10 lb. per sq. in.) when used with a porous material like balsa wood. Some of these cements are hot fuelproof; those that are should naturally be used on exposed portions of the model.

Generally speaking, the slower-drying cements are slightly stronger and should be used for most construction work, particularly on the larger models. The really fast-drying cements are excellent for field repairs and for the smaller, more lightly loaded ships.

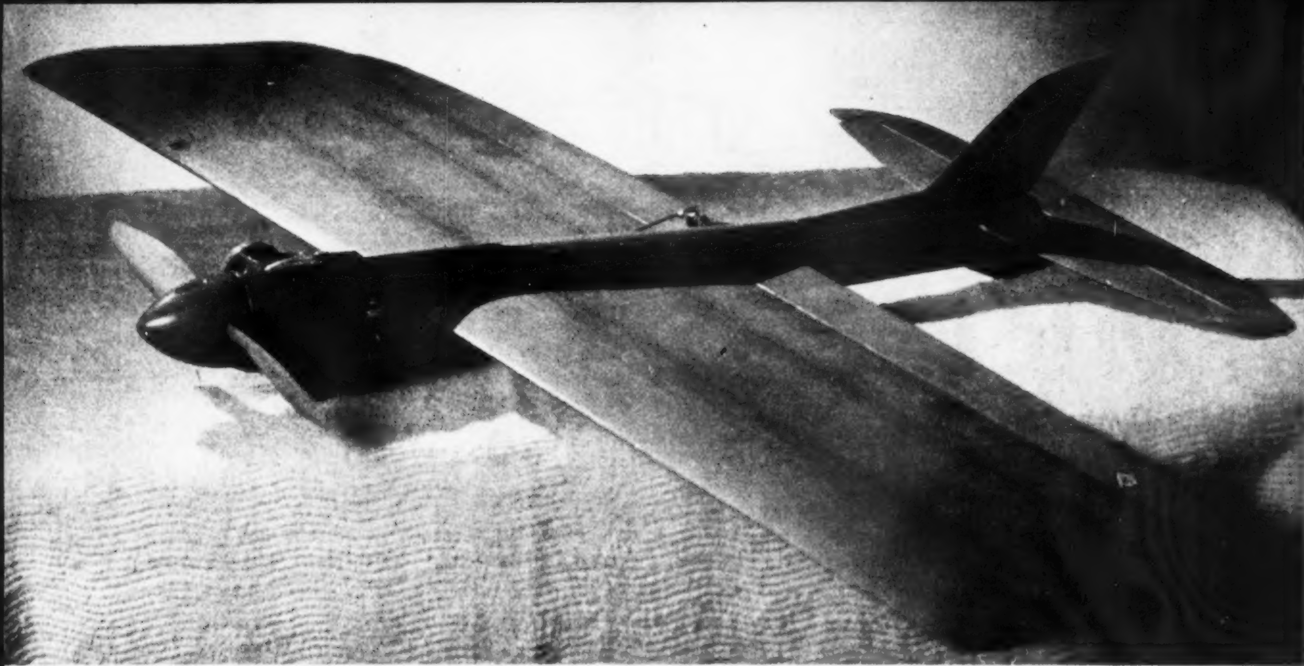
In addition to the pyroxalin cements, other adhesives are worthy additions to any self-respecting modeler's workbench, urea-formaldehyde resin and starch glue and the relatively new, water-soluble, phenol resin, soybean and corn gluten glue being two of them. The former (Weldwood) is exceptionally good for use with plywood and all hardwoods, offering exceptional strength with waterproof and hot fuelproof qualities. The chief disadvantages of this material are the long drying time (about 24 hours) and the necessity for considerable clamping pressure to obtain maximum strength.

The second type mentioned in the preceding paragraph offers wonderful possibilities for the model builder. It is milky-white while wet but dries to transparency. This glue has been used very successfully to bond maple motor mounts to a balsa fuselage and stay put under the pounding of speed contest flying. It requires little clamping pressure, may be diluted with water and will successfully bond wet wood! The drying time is only slightly greater than that of the slower pyroxalin cements. Works beautifully in balsa-to-balsa joints and is waterproof and hot fuelproof. Should prove beneficial to the radio boys and the hydro clan. Sold under several names, Elmer's Glue and Woodlock being two of them.

Of course, not even the highest quality adhesive can compensate for the errors of faulty workmanship. For maximum strength, a smooth, snug and uniform wood-to-wood contact is needed: not tight, George, smooo-oooth! The best method is to double-cement with a light pre-coating, allow to dry, and then add a final light coat just before joining the pieces. The initial coat reduces the porosity of the wood and the second coat makes the bond. Excessive cement does nothing but waste a lot of hard-earned shekels and make lots of work sanding the lumps and bumps to get a smooth finish.

To provide maximum "tooth" for adhesives, don't sand to a smooth surface wood that is to be joined; leave it slightly rough. This will increase the effective area of the joint and you can't see through the durned thing anyhow.

Patience and practice develop skill; skill in the construction of a model is the yardstick by which the model and the modeler are measured.



Mid-air collisions and crashes on hard ground don't mean curtains to the Flexi-Bull-It. The sheeted-over wing—by Pliobond—eliminates silly paper.

Something NEW in Combat...

Side-mounted engine saves engine in crashes—ship leads with its nose! Side-mounting gets weight toward outer tip, saving that tip weight.

Combat jobs are not expendable. Sensational—and proven!—construction ideas in the Flexi-Bull-It described in classic article.

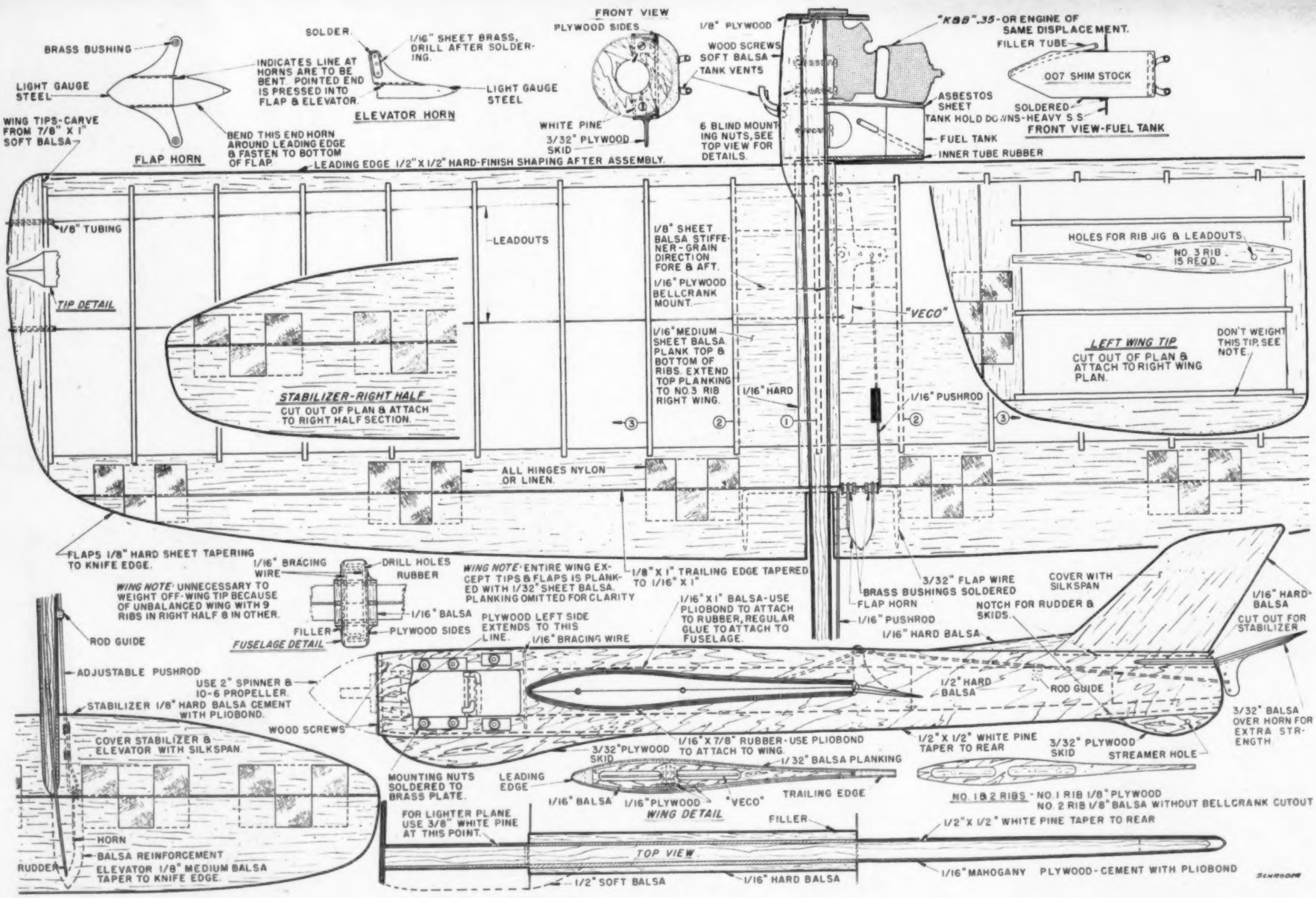
This tank puts K & B Allyn .35 close to leading edge for better cornering. Thin wing important for speed, hence flaps for the maneuvering.

By VAN VANDERSCHEL

► Here is the ship all you combat fans have been dreaming about! A ship with revolutionary construction principles. Believe it or not, the original Flexi-Bull-It has been entered in two Open elimination-type contests and has won a second and first respectively under tough competition. This one ship has already weathered two severe mid-air collisions and two hard crashes into asphalt and hard ground. Now, after minor stab repairs, it is ready to go again. This ship is engineered not only to take a lot of punishment: it can really dish it out, too!

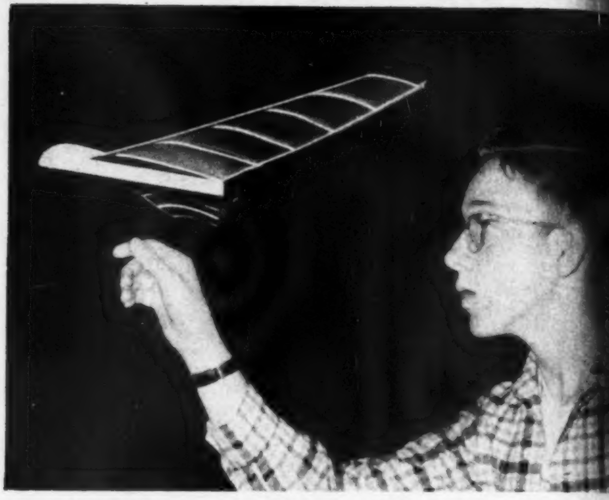
It may be well to note, first, that combat has changed considerably in the last few years. A contestant with an old stunt ship or trainer has about as much chance of coming out on top as a Model T would have at the Indianapolis 500. Today, the modeler really needs a ship designed for the job to bring home the hardware. Having officiated at and judged several combat contests, I have become convinced of what I consider a crying need for a much stronger ship, for as power and speed have increased, so has the heart-breaking rate of destruction. Many old timers have dropped out of competition in protest at the construction time so easily tossed to the winds with a blasted model. For example, in a recent meet in West Texas, 29 ships were demolished by 23 contestants in one afternoon. All trophy winners wrecked two and even as many as four ships in this contest with the exception of Stan Thorpe, who flew this ship through five eliminations to second place. Incidentally, it could still fly when the contest closed, despite three crashes. Two of these were mid-air collisions which demolished the other ships involved.

Many of you choppers may not believe this ruggedness can be obtained without sacrificing performance. But don't take our word for it: just build (*Continued on page* 36)



FULL SIZE PLANS AVAILABLE. SEE PAGE 54.

Indoor towline. Converted tissue-covered stick model by Paul Jones readies for launching. Length of towline limited by height of lights.



Bill Belt's fine flying wing towliner begins an official flight. Unofficially this job did 1:14. As in all indoors events, the single high time wins.

INSIDE Story

By LAWRENCE H. CONOVER

It's the future that counts, not the past, in indoor modeling, says the Iowa-Illinois Aeronautical Association. Here's the pitch.

► During the past five years, while the "gloom and doom boys have been forecasting the demise of indoor flying, members of the Illinois Iowa Aeronautical Assn. have been enjoying this quiet phase of model flying. Our annual indoor contests have continued in popularity each year, despite the fact that it is a strictly wintertime activity and most of the guys are controlline fiends with no particular feel for 1/16 squares and superfine tissue.

This continued attendance makes us think we may have the right idea. We have a lot of fun at these indoor sessions and we believe other modelers would, too. May we tell you about it?

No one in this area has a 14-minute tissue job, so we call our activity sport flying. And we have the events to suit it: *Unusual Design Event, Payload, Towline, Spot Landing,* and the more common *HL Glider, Tissue Stick, Microfilm.* Plenty to choose from here. What'll you have?

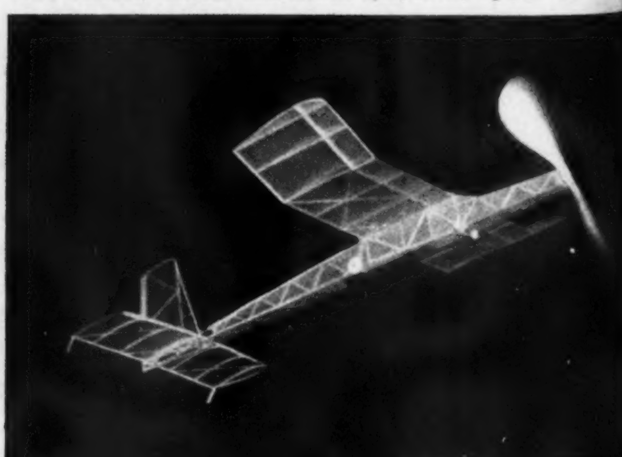
Our flying site is not ideal, but we make the most of it. Area is 100 sq. ft.; arched roof. Usable ceiling about 55 ft. Lights and crosswires at 35 ft. level. Although times do not compare with those of "indoor men," performance has increased each year. Tissue-stick topped at near two minutes, first meet. Now is over five. HL glider, 25 seconds first year. We're pushing 45 seconds now. Heavy mike jobs have flown seven minutes, but we've had bad drift conditions at most contests. Towline is a very popular event; some very unique ships. Best time so far is 1:14 on 35 ft. lines. Best in payload is 1:37. Ship weighed .37 oz.; payload, .50 oz. This is a real challenge indoors, where the space and ceiling are limited. The Unusual Design Event is always very interesting. We have had helicopters, ornithopters, deltas, flying wings. (I have been waiting for some "Conrad" to show up with a fly-powered flying saucer. This could happen!)

Microfilm has the least number of entries but we don't throw it out; it provides a high class event for graduation from tissue.

It need not cost a lot of money to run an affair like our

Belt, whose model and helper are shown top, right, shows off a towline delta also entered in the unusual design category. Delta poor glider.

Oh, no, not payload! Author's payload (½ oz. load) climbs out. A miniature Wakefield, condenser tissue-covered. Span, 20 in.; wgt., .37 oz.



Hard-working Junior from Galesburg, Ill. Club, Mike Dawson, launches his "mike" entry. Microfilm allows builders to "graduate" from tissue.

With one swept-back wing, and the other swept forward, this Unusual Design entry (Paul McIlrath) is smooth-flying tandem that has done 1:44!

annual indoor contest. We give prizes down to third in as many as nine events. This means 27 prizes. The IIAA allots $25 for the contest. We have seldom used the whole amount. To get by on this small budget we have to dream up some fantastic trophies. It's a lot of fun. Do you know any place where you get as first prize a brandy snifter (empty) with appropriate lettering in gold? And smaller ones for second place? (The snifters were surplus stock at a gift shop, and they had a small printing machine which did gold lettering on Scotch tape.) One year there was a whole squadron of plastic model Cougars, P-80's and Sky-rockets, completed, with engraved brass plates on the bases. (The models were easy to make. The brass plates were scrounged from the scrap box, cut to size and polished. Then we borrowed a small hand engraving tool and guides.) Last year we gave flying saucer trophies for first; cellophane-wrapped packages of balsa (factory seconds) for second and third places. We have given ribbons but they are best suited for lower places.

However, the Unusual Design Event always commands a cash award and trophy for the extra effort expended.

An added incentive at our IIAA meets is the amassing of points in competition to decide who has done the most flying and winning throughout the year. This High Point Trophy is awarded at our Annual Banquet. It helps to stir up activity, especially when point totals get close, near the end of the season.

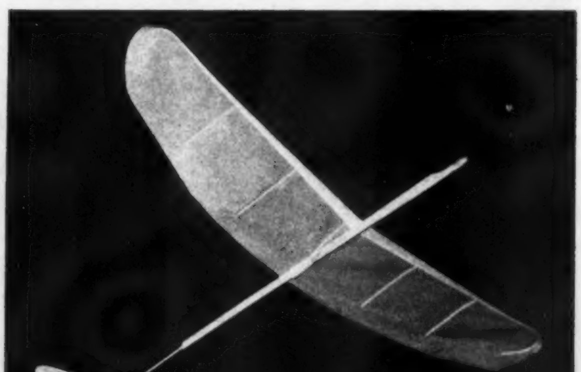
We have found the following problems just naturally accompany this "rebirth of indoor flying":

No Place to Fly—There are many potential indoor sites scattered across the country. But to find yours available, you must go at it properly. As Ed Dolby suggested in a MAN article, The Boston Program (Jan. '54), "A sponsor is desirable." You will have to convince your prospective sponsor that your program is a valuable activity. You may wish to use some of these points: That it keeps the minds and hands of young people interested and busy, thus combating juvenile delinquency; that it furthers our country's aviation progress by providing early basic training for a career in this ever-growing field. Even now, responsible people in Washington are concerned over the public's lack of interest in aviation. The enthusiastic Lindbergh Era is long gone.

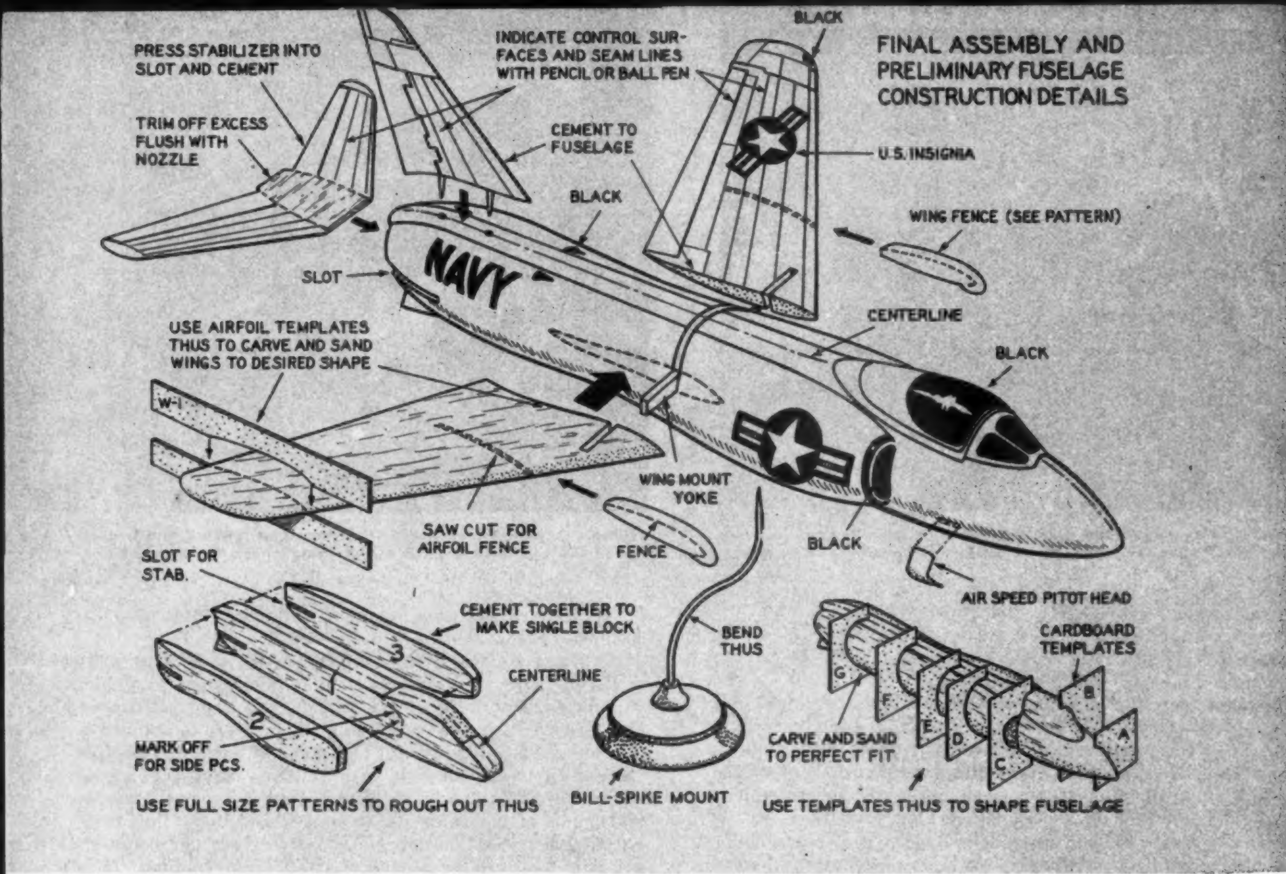
It will help to display a working model. To the layman a mike job easing across the room at a less-than-leisurely pace is something almost magical. Once the impression is made, hit him hard with a plan of action: a detailed program, set-up. Ready to go as soon as you have the place to fly. If you can show your man you really mean business, you will get the help.

Lack of Supplies—A big problem which confronts both mike and tissue, at least in this area, is the strongest of small rubber sizes. Our tissue jobs are now heavy enough to require ⅛ rubber, but if we (*Continued on page* 51)

Author's flexible trailing edge approach in towline model has Zanonia-type stability. Check us on that, but doesn't this refer gliding leaf?



Well-known team race man Ken Johnson (co-designer of Sheik) seems enthralled by slow motion, silent flight of tissue-covered stick entry.



This exploded view drawing will give you the idea of how the parts are shaped and how they are put together. And remember that haste makes waste.

SOLID TIGER

By DOUGLAS ROLFE

From these simple plans you can build Grumman's latest fighter—feel proud afterward.

► Latest of the long line of Grumman fighters, the Tiger is still in the experimental stage but is soon destined for fleet service in the United States Navy. A supersonic job, it has unusally thin-sectioned wings, so thin in fact that the main landing gear has to be retracted into the fuselage rather than into the wings as is customary.

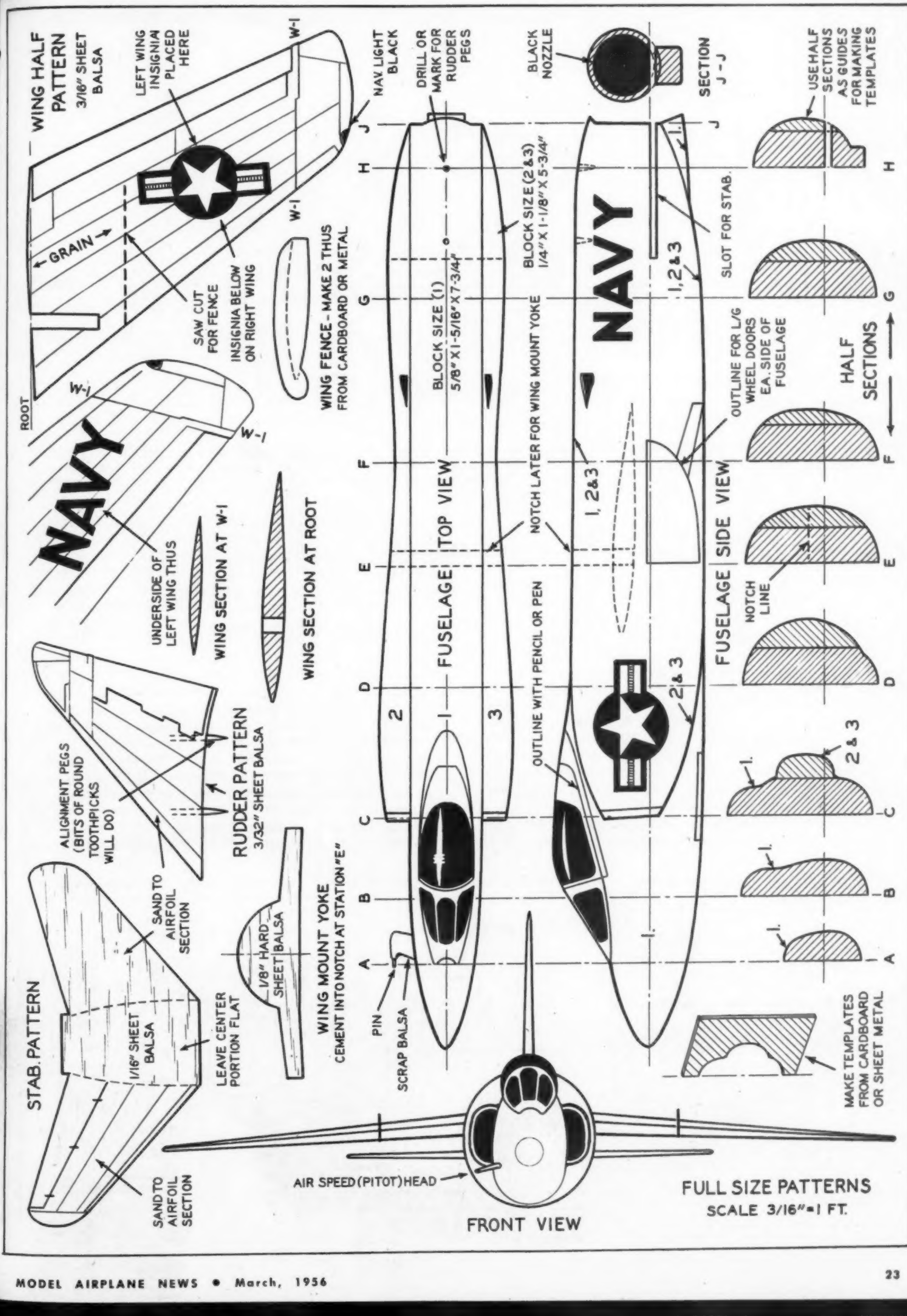
Presently equipped with the Wright J-65 engine and afterburner, its total power is still classified and no performance figures may be given at this date.

The full size patterns include all marking details and by following these faithfully you will have an unusally detailed scale model which will be the envy of the neighborhood.

Preliminary construction notes: For simplicity, cement patterns to the fuselage blocks. Cut fuselage blocks, wings, rudder and stabilizer slightly beyond heavy black line and trim or sand to exact line. Templates should be cut to the exact outline shown in the half-sections.

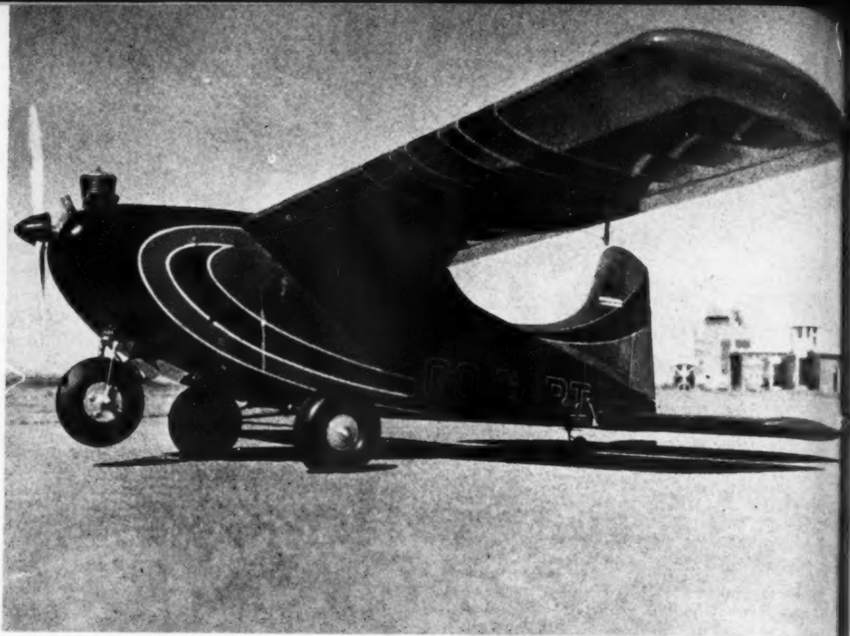
Make half-width templates of the fuselage sections indicated on the drawings. All the drawings are exact size and may be traced, or merely cut out and pasted onto the required templates. Cut out all pieces slightly larger than the given sizes to allow for trimming and cut and sand down to the exact size. We have (*Continued on page* 42)

New low tail position and the "coke bottle fuselage," with its pinched-in top view at the wing position, are main features of the very fast Tiger.


WING HALF PATTERN 3/16" SHEET BALSA
LEFT WING INSIGNIA PLACED HERE
W-1
GRAIN
SAW CUT FOR FENCE
INSIGNIA BELOW ON RIGHT WING
NAV. LIGHT BLACK
DRILL OR MARK FOR RUDDER PEGS
BLACK NOZZLE
SECTION J-J
USE HALF SECTIONS AS GUIDES FOR MAKING TEMPLATES
ROOT
NAVY
UNDERSIDE OF LEFT WING THUS
WING SECTION AT W-1
WING FENCE - MAKE 2 THUS FROM CARDBOARD OR METAL
WING SECTION AT ROOT
BLOCK SIZE (1) 5/8" X 1-5/16" X 7-3/4"
FUSELAGE TOP VIEW
BLOCK SIZE (2 & 3) 1/4" X 1-1/8" X 5-3/4"
NOTCH LATER FOR WING MOUNT YOKE
SLOT FOR STAB.
OUTLINE FOR L/G WHEEL DOORS EA. SIDE OF FUSELAGE
FUSELAGE SIDE VIEW
HALF SECTIONS
NOTCH LINE
OUTLINE WITH PENCIL OR PEN
ALIGNMENT PEGS (BITS OF ROUND TOOTHPICKS WILL DO)
RUDDER PATTERN 3/32" SHEET BALSA
SAND TO AIRFOIL SECTION
STAB. PATTERN
1/16" SHEET BALSA
LEAVE CENTER PORTION FLAT
1/8" HARD SHEET BALSA
WING MOUNT YOKE CEMENT INTO NOTCH AT STATION "E"
PIN
SCRAP BALSA
MAKE TEMPLATES FROM CARDBOARD OR SHEET METAL
AIR SPEED (PITOT) HEAD
FRONT VIEW
FULL SIZE PATTERNS
SCALE 3/16"=1 FT.

Radio Control News

For 15 of its 27 years, MAN has been reporting the RC developments. Here's the latest round-up covering new items, news and dope.



McCullough's Go Cart: 5 ft. span; Atwood .49; weight, 9½ lb.; loading, 30.4 oz. Babcock three-channel, pulse. High tone, rudder; triplex circuit, motor, ailerons on full off, on, respectively; rudder tone. Low, medium, for trim, steerable wheel, brakes. Rud neutral on flippers. Tough to fly.

By E. J. LORENZ

CLUB NEWS

► "The time has come," the Walrus said, "to speak of many things." We don't have a Walrus around and we have only one thing we want to speak about: **Have you sent in your FCC registration form?** The number of registrations on file is growing but it still falls short of the actual number of RC users in the country. This column has mentioned that the FCC has allotted 27.255 mc to other functions besides radio control flying and boating. A 500 watt station with a 150 ft. antenna can affect a model flying at an altitude of 300 ft. at a distance of over 32 miles. And this is based on the figure of 100 microvolts-meter for receiver sensitivity. Actually, we believe this figure to be closer to 65 or 70 uv-mtr, in which case the range of interference is even greater.

It has been suggested by Dr. W. A. Good through the AMA that those stations using high power be operated about .25 mc away from the 27.255 mc spot. This, of course, is up to the FCC. What can you do about this matter? Walt Good suggests the following: promote the obtaining of permits; encourage individuals, RC clubs and RC manufacturers to write to the FCC at Washington 25, D.C. and to U.S. Congressmen stating our problem and the unfairness of the potential interference and to report cases of actual interference to AMA headquarters, 1025 Connecticut Ave., N.W., Washington 6, D.C. If you've taken lightly our past requests to file FCC registration cards, this is a good way to make up for it.

Kelly Day, Wappingers Falls, N.Y. has been having great success with this Breezy model, using the transistorized conversion that was explained last month. He also used our MOPA transmitter (MAN, 8/54) with a 3LF4 substituted for the 3D6. This tube is a direct replacement for the 3D6 and although it has less power output, the filament drain is but 100 ma. Do not use more than 135 volts on the plate of this tube.

Ware Lantz of Seattle, Wash., is only one of many

Smokescreen device. Any money in crop dusting?

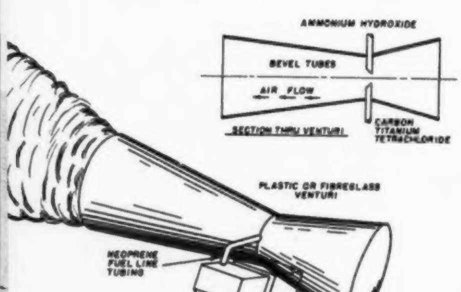


Fig. 1 SMOKE SCREEN UNIT

LOCATE TANKS AS CLOSE TO VENTURI AS POSSIBLE.
DO NOT RUN INDOORS. AVOID BREATHING FUMES WHILE LAUNCHING.

A—Original Lorenz, two gas tubes; B, C, D—Voltage doubler, tripler and quadrupler circuits.

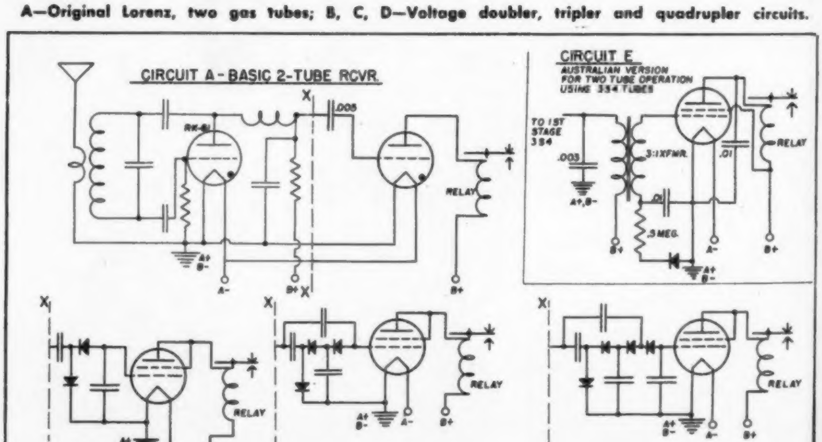


Fig. 2

Dutch Typhoon 5,000-Ohm relay. Sturdy base is ideal for mounting the relay remotely from receiver. Screw adjustment, rigid contact support.

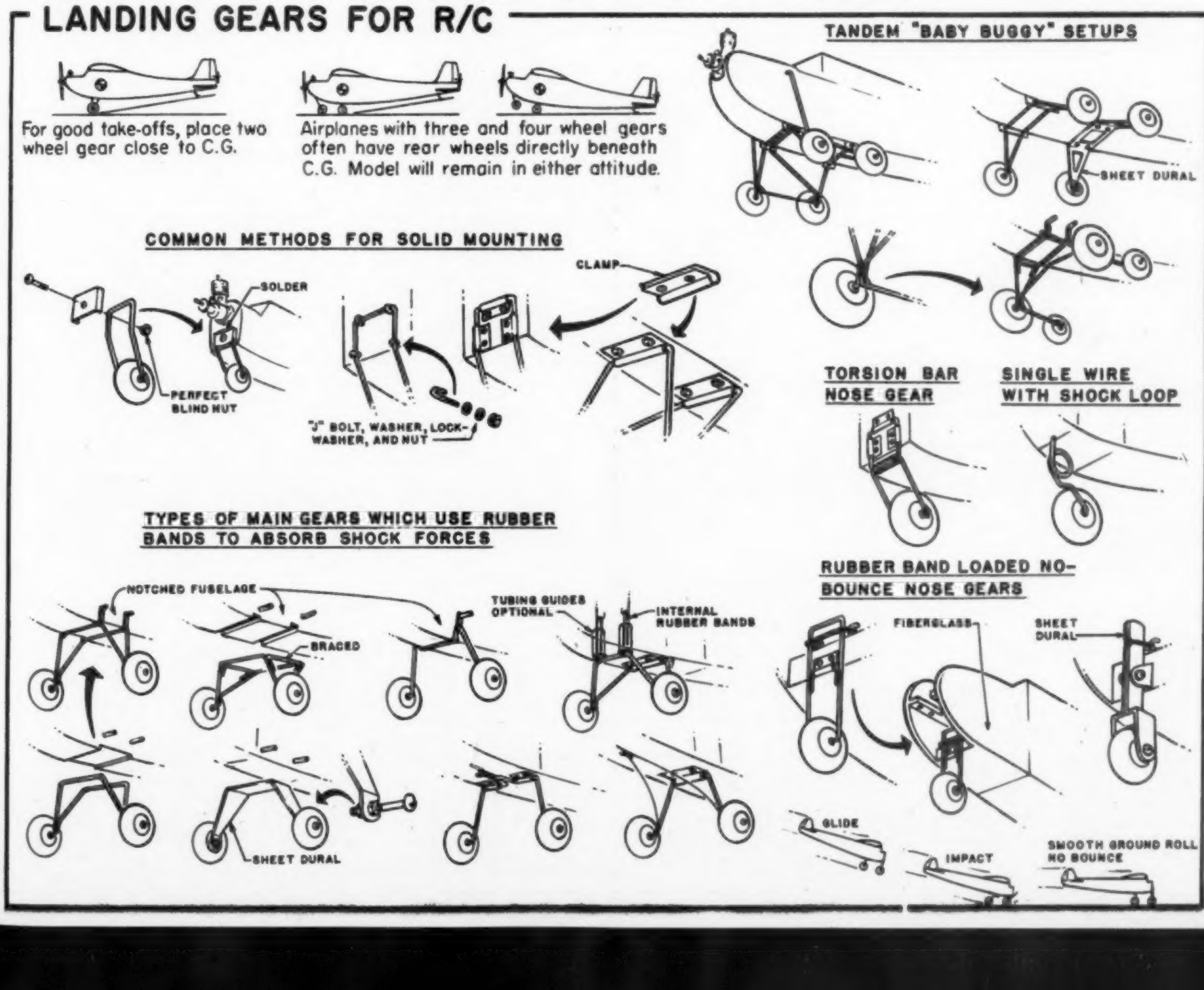
newcomers who have inquired about RC rules and regulations. Since you should be familiar with the patterns flown and the number of points awarded, check with your local AMA representative or write to Carl R. Wheeley at the Washington, D.C. headquarters. You'll need this information for contest work and even if you don't intend to enter a contest, we believe you'll find it more fun to pattern work rather than just fly around.

The Radio Control League of North Carolina is now a year old and has taken a real stand on the crowded frequency problem. The group, headed by Dr. Henry Thaxton of Lynchburg, Va., as president, has a list of 35 signatures being sent to the FCC regarding other RC bands or spot frequencies. This group is really spread out in order to cover all sections of North Carolina and the surrounding areas. Vice president is Dr. W. C. Hewitt of Durham, N. C.; treasurer is Warren Hall of Burlington, N. C.; Jim Thrift of Winston-Salem, N. C. is the contest director and Ralph Corelle, who hails from Salisbury, N. C. is the secretary. Personal liability insurance is also stressed by this group. This came in mighty handy when an RC job tried to "home in" on a color TV antenna. Anyone interested in RC activities in this area or in information on insurance should contact Ralph Corelle c/o this column. Just as this issue was being put to bed, Jim Thrift dropped a line indicating that scale jobs are high on the list of RC planes, with Tri-Pacers and Cub J-3's in the lead. The Live Wire series is next in line for the popularity vote.

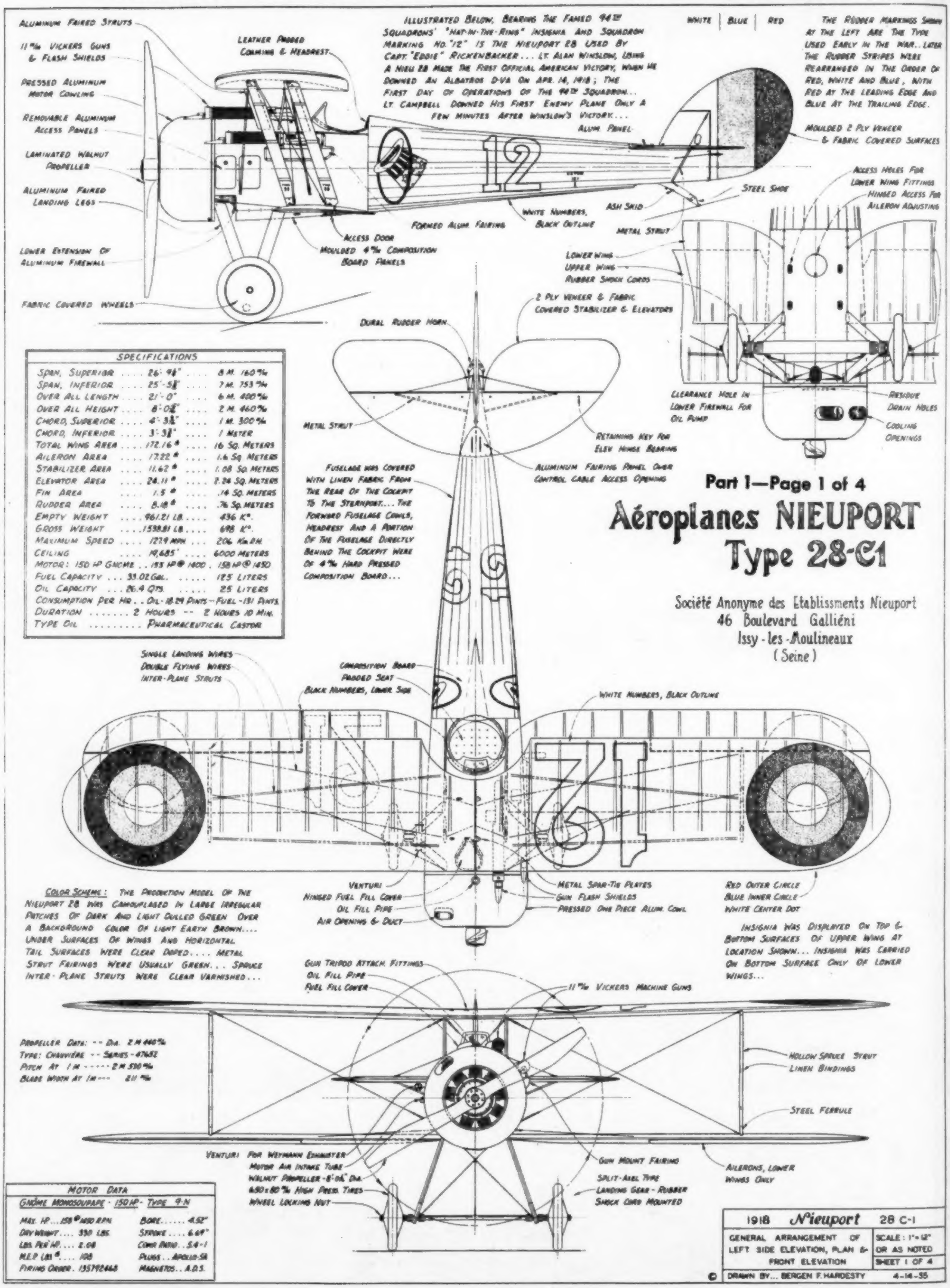
TECHNICAL TOPICS

What can be more soul satisfying than doing a bit of lazy skywriting against a blue summer sky? Many readers have inquired about skywriting techniques. There are two basic ways of producing smoke for this purpose: chemically and by burning a powder. The latter method will produce dense clouds of smoke, in various colors, too; but problems attend the initial ignition and control of output. Various chemicals, when exposed to air, produce smoke; e.g., carbon titanium tetrachloride, obtainable from chemical supply houses. A denser smoke (*Continued on page 44*)

Rounded up by Frank Dazey, these are the most popular gear types. It would be difficult to trace their originators. Bonner favors single-notch type for simplicity, lightness, alinement. Vic Nelson favors no-bounce types. Bob Coon, Webb Hill responsible for straight running tandem creations.



NIEUPORT 28—FRENCH FIGHTER FLOWN BY RICKENBACKER.



Part 1—Page 1 of 4

Aéroplanes NIEUPORT Type 28-C1

Société Anonyme des Etablissments Nieuport
46 Boulevard Galliéni
Issy-les-Moulineaux
(Seine)

SPECIFICATIONS

SPAN, SUPERIOR	26'-9⅛"	8 M. 160 M/M
SPAN, INFERIOR	25'-5⅜"	7 M. 753 M/M
OVER ALL LENGTH	21'-0"	6 M. 400 M/M
OVER ALL HEIGHT	8'-0⅜"	2 M. 460 M/M
CHORD, SUPERIOR	4'-3⅛"	1 M. 300 M/M
CHORD, INFERIOR	3'-3⅜"	1 METER
TOTAL WING AREA	172.16 □'	16 SQ. METERS
AILERON AREA	17.22 □'	1.6 SQ. METERS
STABILIZER AREA	11.62 □'	1.08 SQ. METERS
ELEVATOR AREA	24.11 □'	2.24 SQ. METERS
FIN AREA	1.5 □'	.14 SQ. METERS
RUDDER AREA	8.18 □'	.76 SQ. METERS
EMPTY WEIGHT	961.21 LB.	436 K°.
GROSS WEIGHT	1538.81 LB.	698 K°.
MAXIMUM SPEED	122.9 MPH	206 KM.PH.
CEILING	19,685'	6000 METERS
MOTOR: 150 HP GNOME	155 HP @ 1400	158 HP @ 1450
FUEL CAPACITY	33.02 GAL.	125 LITERS
OIL CAPACITY	26.4 QTS.	25 LITERS
CONSUMPTION PER HR.	OIL - 18.29 PINTS	FUEL - 131 PINTS
DURATION	2 HOURS	2 HOURS 10 MIN.
TYPE OIL	PHARMACEUTICAL CASTOR	

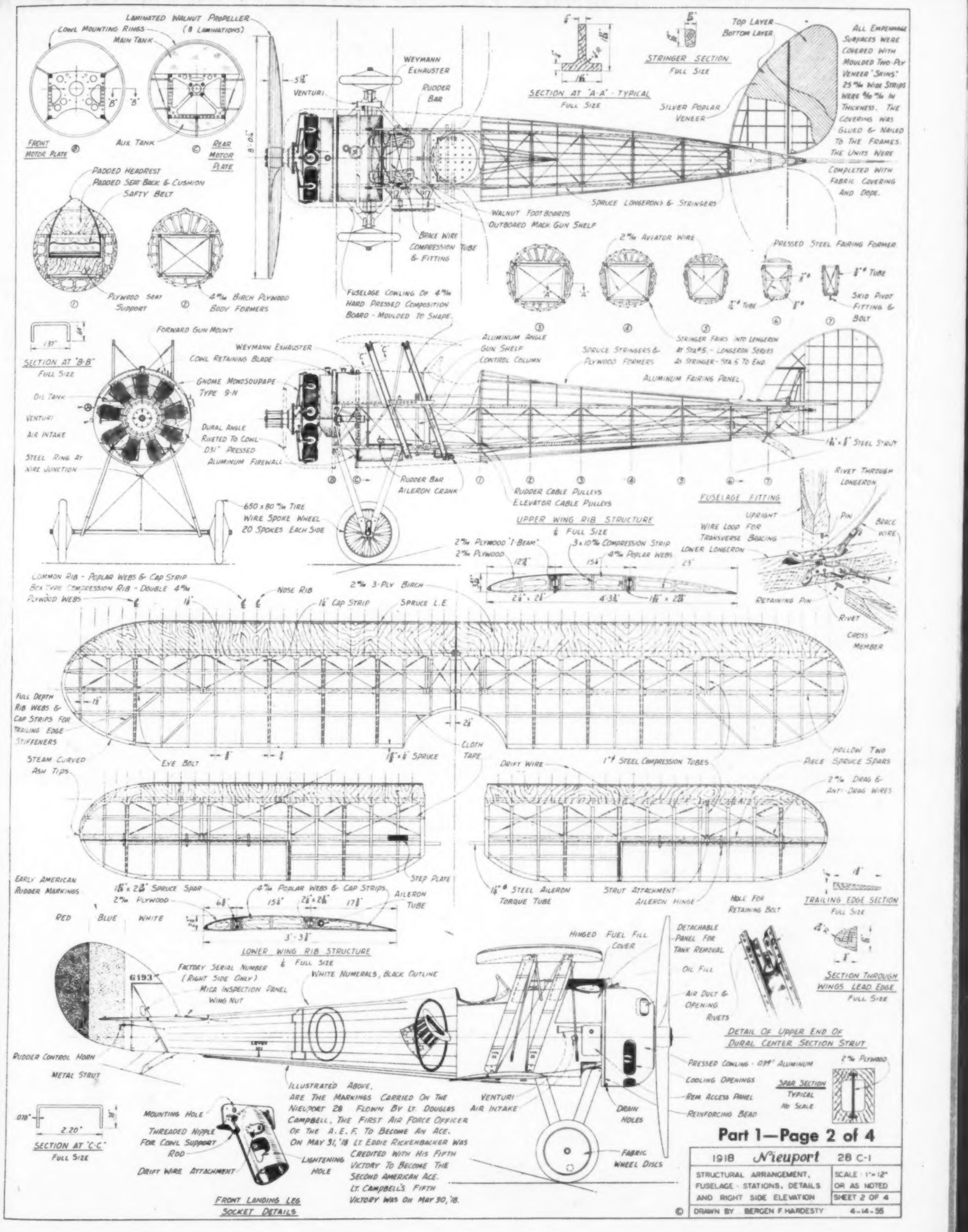
MOTOR DATA

GNÔME MONOSOUPAPE - 150 HP - TYPE 9-N

MAX. HP ... 158 @ 1450 RPM.	BORE ...... 4.52"
DRY WEIGHT .... 330 LBS.	STROKE ..... 6.69"
LBS. PER HP. 2.08	COMP. RATIO .. 5.4-1
M.E.P. LBS □" 108	PLUGS .. APOLLO-SA
FIRING ORDER . 135792468	MAGNETOS .. A.D.S.

1918	Nieuport	28 C-1
GENERAL ARRANGEMENT OF LEFT SIDE ELEVATION, PLAN & FRONT ELEVATION		SCALE: 1" = 12" OR AS NOTED SHEET 1 OF 4
© DRAWN BY... BERGEN F. HARDESTY		4-14-35

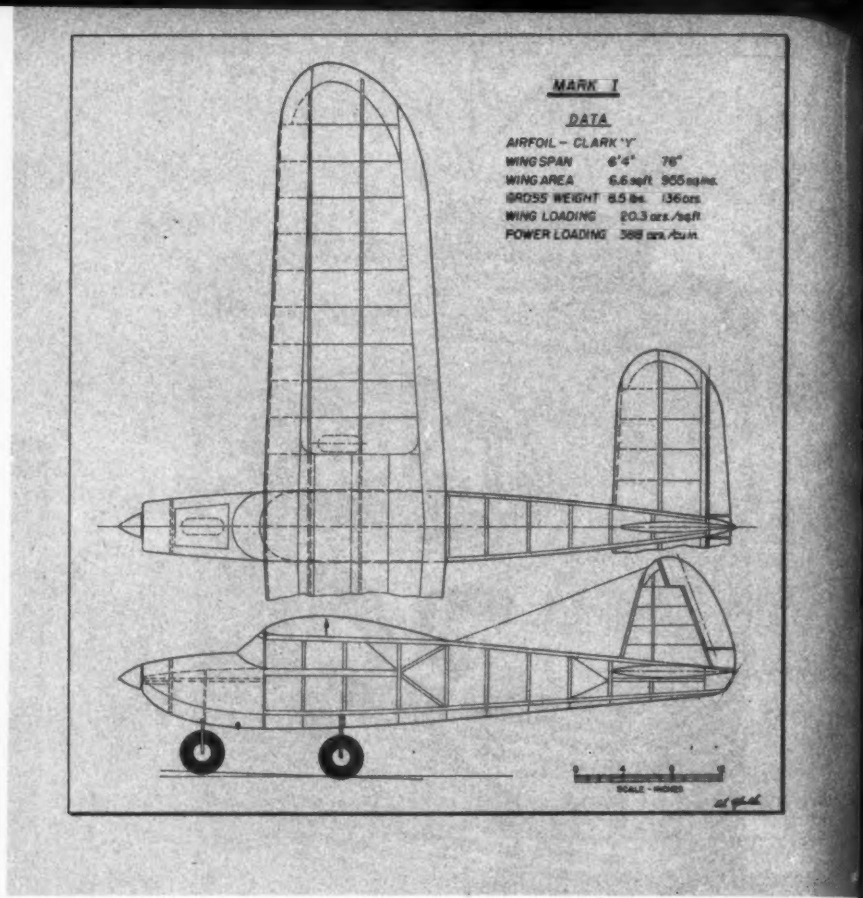
THE COMPLETE DRAWINGS TO BE PRESENTED IN TWO ISSUES.



First plane of the series with Clark Y tapered wing proved very easy to launch despite weight.

Below—Third plane involved smaller size, less weight and drag. Two wheels, NACA 2412 section.

Right—Plans right, opposite page, offer interesting comparisons between the three aircraft.



Notes on Multi . . .

A year of development went into these experiments with three related airplanes. This is the first of three articles.

► Of the misconceptions that abound in the radio control field, none is more widespread than the belief that the more controls you have, the easier it is to fly. Multi is not to be feared, but to get satisfying results from a big investment, it is to be approached with open eyes and mind.

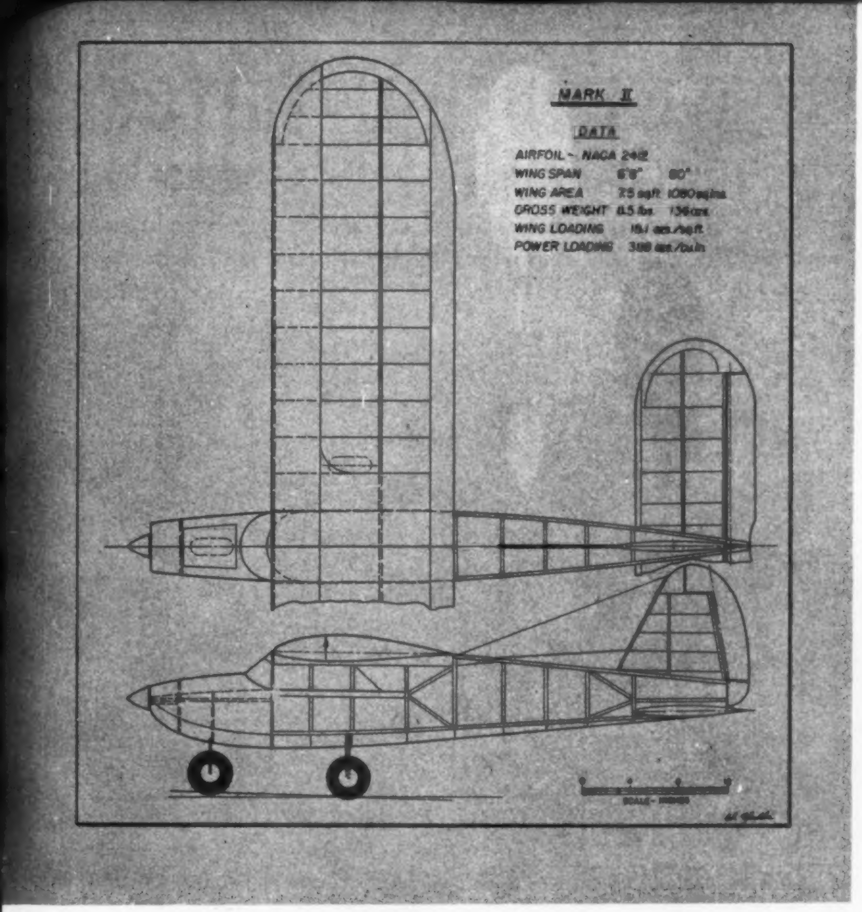
Late in 1954, MAN felt its RC program should be extended to muli-control. Two basic types of equipment were on the market: the Babcock three-channel, which electronically filters tones to operate by one channel a compound escapement (and through it a motor control) and an elevator trim servo by two channels for up and down control; and the reed bank receivers of from two to six channels. Coverage of the reed type of receiver was afforded in Harold deBolt's article and plan for the Equalizer (MAN, 11/55); the staff experiments were based upon the Babcock. What originally was intended to be a one-ship trial soon turned into 15 tough months of development covering three airplanes.

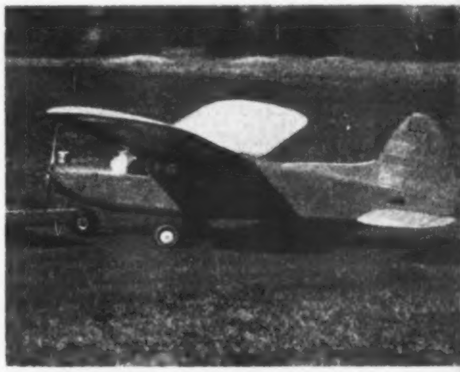
Incidentally, the specifications and weights of all these planes are not necessarily ideal for this equipment: one contest was won by a Sterling Tri-Pacer with the three-channel Babcock. Schumacher himself flies the multi Babcock in a deBolt Cruiser. Some multi rigs have been installed in Half-A; Schmidt, etc., have been flown in everything from Mills .08 up, .15 to .19 engines being commonplace.

Shown here in two-view form (detailed plans of Mark III accompany the second article), the ships are designated Mark I, II and II. This does not imply a straight line development because the three aircraft differ widely. This is the rundown.

The first question facing the single-channel man going into multi is whether or not the craft is to be fully stuntable or partly stuntable to perform like a full-scale airplane. Mark I was to be a sport type of airplane, to be dived moderately, perhaps looped, but to be maneuvered about the sky with precision. It purposely was made extra large for contingencies.

Technique on multi calls for outside loop entries to be made downward and. if inverted flight is wanted, to do a half, downward outside loop. But here, the self-neutralizing servo normally does not maintain the necessary down-elevator. If enough for outsides, it is too much for inverted. If right for inverted, it is not enough for outsides. Switches on such servos are altered to carry certain desired elevator settings instead of neutral, after both down and up. Or, in addition, as deBolt did, the symmetrical airfoil is used so that the plane more readily stays inverted once you put it there. Although trimmable is tougher to fly, it should ultimately be more flexible in the hands of the experienced pilot who knows his airplane. Before going into the flying (*Continued on page 48*)

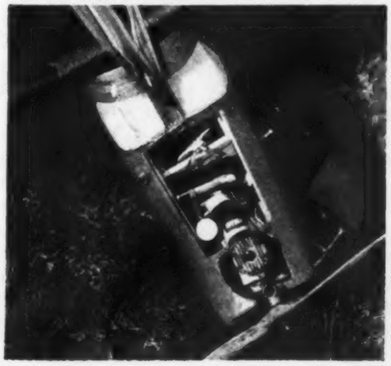


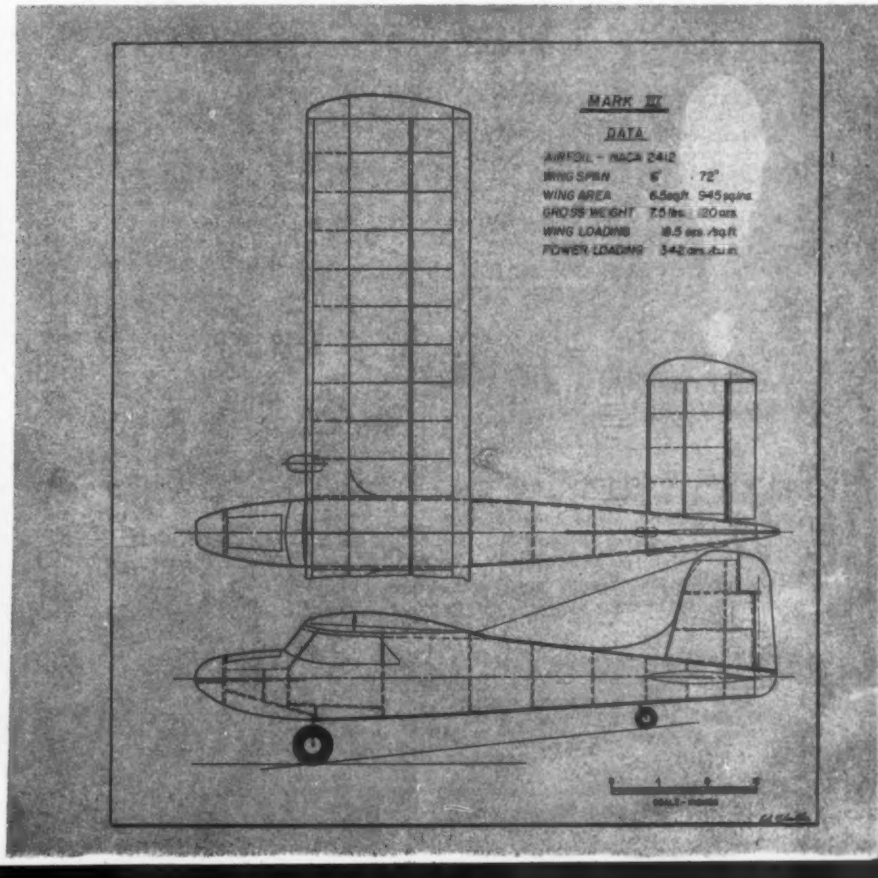


Second airplane saw added vertical tail, bigger wing, NACA 2412 section, harder launch.

Below—Third plane shown exactly same scale as second, above, has sheet body. A .35 a bit hot.

Installation of Babcock three-channel receiver, trim servo, engine air-bleed escapement in #1. Tank and battery compartments used on #1 and 2.





P. G. F. CHINN

FOREIGN NOTES

A monthly world-wide round-up of technical developments, designs, significant industrial products.

England: New Class I Speed Record

On December 4, Ray "Gadget" Gibbs who, as reported last month, set a new FAI Class II (.30 cu. in.) speed mark of 146.21 mph, clocked 123 mph with a new Class I (.15 cu. in.) model. Substantially exceeding Prati's Super-Tigre record of 118.35 mph, despite the use of the new longer lines, it seems probable that this, rather than the Czech claim (see FN, 2/56) of 126.47 mph, will be accepted as a new world record. The validity of the Czech claim is in some doubt because of their use of ultra-thin lines. Gibbs' model was again powered by one of Fred Carter's home-built specials, had a span of 14 in. and weighed 9 oz.

Italy: International Slope Soaring

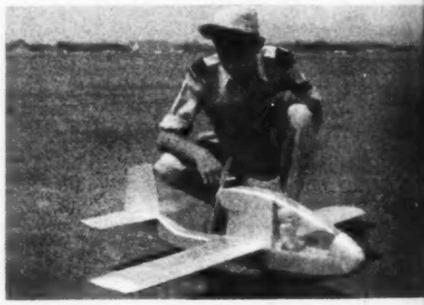
Hans Gremmer, exponent of Vane-Steering, won the 1955 International Slope Soaring meet at Trentino. Slope soaring, fairly popular in Europe, has led to the development of such devices as compass-steering and light-steering, as previously described in this column. Vane-steering is a much simplified version of the normally complicated compass-steering set-up and dispenses with batteries and a separate actuator. A 1oz. Alnico bar magnet is coupled directly to the rudder or steering vane.

In Gremmer's winning model, the entire steering unit was mounted on the nose (taking the place of the ballast weight), there being a tall fixed fin with a narrow, horn-balanced vane hinged to its rear edge. The powerful Alnico magnet was attached directly to the base of the hinge pin. The rest of the model followed fairly typical German A.2 sailplane design: i.e., a long, slim, stick-like fuselage and medium-high aspect ratio wings of thin section. A nylon turbulator was mounted in front of the LE.

Russia: Big Claims for New .15

Now receiving attention in East European countries for exceptional output claims are reports of a new Russian .15 cu. in. International Class Diesel designed by O. K. Gajevski. The engine, known as the Type MK-12k, is a development of an earlier model by the same designer, the MK-12c. Both are disc-rotary, twin ball-bearing Diesels, but whereas an output of .22 bhp at 9,000 rpm is mentioned in connection with the MK-12c, the claims for the MK-12k are no less than .356 bhp at 16,500 rpm. This is at least 15 per cent better than the best independent test figures realized for highly developed Western Diesel .15's and as, hitherto, Russia has had scant experience in the development of high-performance miniature engines, we are bound to regard these figures as open to doubt, pending the opportunity for accurate testing on this side of the Iron Curtain.

In general, the design of the engine is conventional, with a radially-ported, reverse-flow scavenged cylinder, inserted liner, counterbalanced crankshaft and the popular European 15 x 14 mm. (.5905 x .5512 in.) bore and stroke. However, the cylinder head incorporates an 0.8 mm. spring shock-absorber between the compression-screw and contra-piston, in the manner of the OK Cub Diesels, while the contra-piston itself embodies a small anti-detonation chamber which is said to be responsible for a "500-1,000 rpm" increase. Another feature of this engine is the unusual needle-valve and fuel inlet which is mounted above the intake, only the jet itself protruding into the venturi.



This most unusual pusher controlliner was built by Lt. Soebagio of the Indonesian Air Force.

Belgium: Controlline Internationals

Although not an official FAI World Championship event, the Criterium d'Europe all-controlline event, held annually in Belgium since 1950, is well supported by various European countries and generally produces some keen rivalry and

Cuban TV Star Bruce Eglington's Dyna-Jet-powered Cougar had maiden flight filmed for television.

Rubber-powered model expert, Rudolph Cerny of Prague, with his latest Wakefield. It is sharp.

high performances. This year, 10 Continental European countries, plus the USAFE, were represented.

In the speed event flown to the official FAI rules calling for a 2.5 cc (.15 cu. in.) motor, the Italian Super-Tigre G.20 motor came out tops by achieving 116 mph in a model flown by the noted Spanish expert, Battlo. Emil Fresl's Torp .15 achieved second spot with 113 mph for Yugoslavia, followed by the Italian world record holder Amato Prati (Super-Tigre) with 112 mph.

Unexpected was the defeat of popular Bob Lutker of the USAFE in the stunt event by German modeler Rieger, who flew a Webra-.15 powered model. Rieger was exceptional. The team race resulted in a clear win for Smelt of Holland, using a modified ED motor with reed-valve induction. The combat was well named for belligerency and, out of the ensuing slaughter, Belgium was determined the winner, with Germany in second place.

Norway: Variable-Speed Diesel Controlliner

Norwegian stunt champion B. S. Ellingsen has a rather unique David Anderson Diesel-powered controlliner in which both compression and mixture are fully controllable during flight. Two small electric motors actuate the compression screw and needle-valve by means of worm-drive reduction gearing. Batteries for this are carried in the operator's pocket. The set-up works well. The model will remain stationary with the motor running, then speed up and take off, go fast or slowly in the air, make an engine-on landing, taxi around, stop and take off again.

South Africa: Miscellany

Earlier in these columns we opined that, with so many contestants in Wakefield and power events recording five maximums, the World Championships rules were in need of revision in order to avoid the unsatisfactory system of deciding the winner by a fly-off. It is generally supposed that if and when the Wakefield rules are revised, permissible rubber weight will be reduced. Opinion on the merits of this, however, is divided.

(Continued on page 46)

Twin OS Max .29's power a Japanese B-25.

ENGINE REVIEW

THE COX Thermal Hopper .049

The reason why Clipper Cargo records went through the roof.

By E. C. MARTIN

► The instruction leaflet that accompanies the Cox Thimble Drome Thermal Hopper .049 stresses the speed, power and easy starting of this Half-A engine. These attributes point up model engine progress over the last three years. In the old days such a statement would have been an unbelievable paradox, for the most powerful engine in any class was never easy to start. This combination of power and startability stems almost entirely from the development of the reed valve introduced in practical form two years ago in the Space Bug by LeRoy M. Cox. The Thermal Hopper is basically the same engine with identical moving parts, but improved in several ways, mainly by the elimination of some of the more cumbersome features of its predecessor.

The performance of the Thermal Hopper is slightly up on that of the two Space Bugs previously tested, no doubt largely attributable to the beautifully made, new multi-jet carburetor which, unlike the old unit which was integral with the fuel tank, can be rotated to any desired position.

Although a very smooth engine, the Space Bug was vulnerable and difficult to mount conveniently because of the compulsory use of its large fuel tank which produced considerable overhang of the prop from the radial mounting bolts. The Thermal Hopper has a three-point mounting plate, incorporating the intake tube, which is bolted to the back of the crankcase, and receives the reed valve assembly on its inner face. With ⅜ in. between the mounting face and the needle valve assembly, there is ample room for a good thick firewall. A commonly heard objection to the Space Bug concerns the undesirable way in which the intake had to project through the firewall and thus allow fuel to get into the interior of the fuselage. Unfortunately, this applies in greater measure to the new engine, for to make a neat job of the mounting, it is necessary to remove the needle valve assembly and insert the intake through a closely-fitting hole and have a sufficiently large aperture behind the firewall to permit access for reassembly and maintenance, unless a permanent installation is contemplated. The alternative is a very large hole in the firewall to admit the jet block and a consequently weak firewall. Obviously, these requirements can be met without much difficulty other than a slight deviation from conventional thinking and the contest record of these engines is ample justification for the effort. Those who condemn the engine because they cannot be bothered can hardly claim to be real modelers. Having expressed our biased views on this subject, let us look into the reasons why we can retain the outstanding performance of the Thermal Hopper only by leaving its configuration intact.

If one accepts the premise that the reed valve is at the present time the most efficient mechanism for controlling the induction of a model engine, then one must also accept the condition that it be located at the back of the crankcase. The reason for this is that the valve assembly takes up a large area of the internal surface of the crankcase in order to allow the optimum size of reed. If one studies the matter, it is evident that there is no other place to mount the valve without increasing crankcase volume and thus sacrificing pumping efficiency or making the reed smaller and limiting deflection with loss of induction efficiency. In other words, there is a minimum size of reed assembly and going below it results in a loss of efficiency, which nullifies the advantage

(*Continued on page 43*)

MAN at Work

(*Continued from page 6*)

served a much better play than they got. Remember the Jabberwock and the Golly-wock? How can you forget such names? Wally went in for compact, high-powered rubber jobs that just exploded skyward—and that is something never seen today: the Roy Wriston, Alvie Dague, Simmers school of flying—to hook a thermal. A great favorite of ours was the Half-A Sniffer, a competent flier and well-designed job for the beginner who is stepping up to a wing papering job. To cut it short, Wally is now a distributor and Frank is kitting the models. Frank's elated at the big play the rubber jobs are getting. Well, how about that! Ask that dealer if he's heard of the Dynamos, Superjabberwock, the new Golly-wock, et al.

• • •

► During the first International Elimination Week-End, May 26-27, fliers from Maine to California will compete simultaneously in Nordic glider, FAI power and Wakefield, according to Ed Dolby, acting for the International Competition Committee. Semi-final contests, or actual team selections, will take place three to four weeks after the eliminations. A percentage of local eliminations entrants will be qualified to compete in the semi-finals. Eliminations will be held in 24, possibly more, cities, and semi-finals in four sections of the country. Location of the 1956 International Contest awaits decision of the FAI. For information, write to Ed Dolby at 25 Exchange St., Rockland, Mass.

• • •

► Hear tell that the Amarillo boys have been asking Lubbock boys for plans of the Flexi-Bull-It (see page 18). Want to get even with Lubbock in combat . . . Phil Kraft free flight in coming issue uses Webra .15 turning an 8 x 3 prop. Phil's a neighbor of W. H. Paxton, Jr., who designed that Mig ducted fan. Seems Bill has a Taifun .15. Bob Holland, the Wasp man, refereed an argument by means of his Strobe light. Both engines turned 12,300 on 9 x 3, giving Phil's VTO a 32 oz. thrust, enough to take off like a rocket. . . . Those queries to MAN some months back about most combat engines being over the .35 limit resulted in a rules amendment to .356. If you come in with a .357, we quit! . . . Tom DeVille, a "subway rider," has been telling us about himself and buddies Carlos Ferguson and Richard Hood in speed. For the season they managed to stay over 160 every flight in D; over 130 mph in B. Ferguson hit a 163 in C. They placed first, second and third in all meets entered. On two lines, yet. Remember the uproar when Buffalo's Len Wagner hit 163 a few years ago? Impossible, missed lap, said the skeptics. Now look!

When members of the Vancouver (Canada) Gas Model Club put on a flying display during a Big Four Amateur Football Game at the Capilano Stadium, the ovation was greater than that given the players. The same paper advises that if you have trouble with Butyrate dope fillets over Ambroid cement, coat all seams and joints with Testor's fuelproof cement, then dope. For Aero Gloss over Ambroid, cover the Ambroid with C-77 cement. . . . And from the Glenside Air Scouts Club (Kiwanis-sponsored), latest issue of Gas Bag, description of ROG event indoors: "It may be a kit or you may build it up yourself from Jasco plans, but the dimensions must be Jasco." However, prop, wood, rubber may be changed. Jasco always do have nice rubber-powered items—if any dope (ambulant variety) should tell you they don't make these things no mo'

(*Continued on page 36*)

(ouch) . . . Overdue praise for that Veco Tug. Have you looked inside that box? No? Well, sneak a look. When it's built, you'll need to launch it with a bottle of milk. . . . Aristo Multi-Meter. Nice item for the RC'er. Fits the pocket. . . . Jim Thrift, Winston-Salem, N.C. and that talk of 1,000 acres of clear flying country—and flying just for the fun of it. As Woody Blanchard said after a meet, "There are no rat races there." The Winston-Salem Jr. Chamber of Commerce took over after the Plymouth Program collapsed. The Recreation Department of the City can't do enough to help the modelers. Jim himself has been 30 years a modeler, has taught two classes in model aviation at the Boys' Club for 15 years, is Senior Leader in Skywriters' Club and handy "flunkie" in the North Carolina Radio Control League. He is Safety Engineer for the Reynold Tobacco Co. On the side, he raised a family. Thar's a modeler.

P.S.—It's Dallas, Tex., July 23-29, for the Nationals.

Something New in Combat

(*Continued from page* 18)

the Flexi-Bull-It and see for yourselves. You will find this ship has extremely high speed (note airfoil), excellent maneuverability, all the stability you could want and moderate weight. It will stay out on the lines in extremely high winds without any weight in the right wing tip. Remember, extra weight here acts like a hammer in a crash. The high speed airfoil also permits this ship to come into the wind with no apparent loss of speed, making it deadly against your opponent's model. This ship has been flown in strong wind on 70 ft. lines. The flaps are a must with this thin airfoil as they give the needed lift in maneuvering and cornering.

As its name implies, the secret of this model's toughness lies in its flexible construction and the use of harder wood in the critically weak spots on normal profile models. A bonding cement known as Goodyear Pliobond makes possible a rubber shock-mounted wing. Joints made with this cement are permanent and remain flexible. It also will bond any material to another and permits you to plank an entire wing very quickly without the use of pins. Both surfaces to be bonded are coated and, after air drying (about five minutes) until slightly tacky, pieces are pressed together by hand. No press or additional drying time is required after bond is made. Trimming, shaping and sanding may follow immediately, speeding up construction. Be sure to use extreme care when lining up parts to be bonded as it is very hard to loosen a bond once the coated pieces have touched together. Acetone, or a razor blade, can separate two pieces that have been improperly lined up, but avoid this if possible. This cement is highly chemical-resistant and can be doped over without damage to the bond.

The original, ready to fly (less fuel), weighed 23½ oz. With a total wing area of approximately 320 sq. in. you have a very low wing loading and with a K & B Allyn .35 up front, you have a very high power-to-weight ratio. Remember the wing being planked eliminates heavy internal spars and less dope is required, cutting extra weight. Also, all-over planking makes the wing much stronger and more resistant to damage when landing on rough terrain. If powered with a lighter engine, such as the Fox .35, fuselage parts can be scaled smaller without losing strength. Fuselage side may take Temico plywood, 1/28 in., instead of 1/16 in. Wing area

(*Continued on page* 38)

Get a Monogram Cadillac Convertible Just for Fun!

Newest
1956
Model

Exactly Like the Real Cadillac With All of the Magnificent Cadillac Appointments and Detail

Ready Now! Monogram's brand new 1956 Cadillac Convertib e. It's a big, beautiful 11¼ inch all-plastic model of the most glamorous and most wanted motor car in the world. It's the most exciting model too. Fully detailed interior and exterior. Fully detailed instrument panel. Fully detailed underside. Real rubber tires and steel axles. Sculptured figures of driver, passenger and dog, for extra realism. Body is beautiful Cadillac red with gorgeous detailed interior. Bumpers and grill are full chrome plated. Even though you may have built a Monogram 1955 Cadillac, you'll want this 1956 model because it is an exact copy of Cadillac's newest design. Made under General Motors authorization and control. Get a Monogram 1956 Cadillac kit at your favorite store today.

Monogram Plastikit • Kit P-13 • $2.49

New Indianapolis Racer for 1956 Fun!

You Can Steer It!

All-Plastic Authentic and Super-Detailed Exact Scale Model

Full-Steering Front Wheels • Driver, Mechanic and Tool Box • Hinged Hood • Dummy Engine • Decals

This is it! "Monogram Special!" Fun to put together. Extra fun when it's done. Modeled after one of the Indianapolis type famous Kurtis-Kraft winning race cars with Meyer-Drake engine. Engine mounted left of center. Driver sits low to the right. Full steering. Front wheels and steering wheel turn together and driver's hand and arm move up and down. Hood is hinged to open and show engine. Sculptured figures of mechanic with tool box and driver included in kit.
This new "500 Speedway" model is the one you have been waiting for. It's the last word in realism and authentic detailing and scale. See it. Get it at your favorite store today.

Monogram Plastikit • Kit P-12 • 98¢

Win One of 40 Trophies and Other Awards!

Trophy 10½ inches high

Enter a Monogram Model Building Contest in Your Own Town!

See the model and hobby dealer right in your own neighborhood. Ask when his contest will start. If he doesn't plan on starting one, ask him to get a Monogram Model Building Contest package with 40 awards and Official Entry Blanks and get a contest started quick. Then get into it.

Two Junior Divisions

Up to 13 Years

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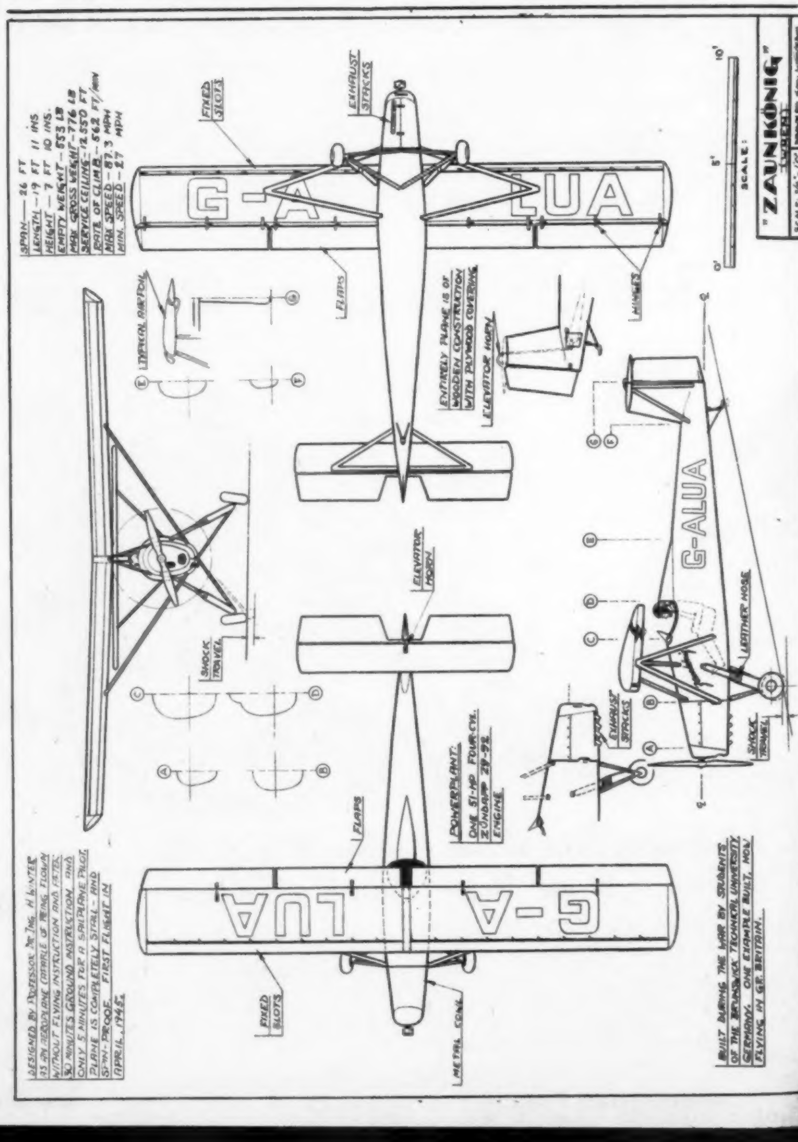
can also be cut to about 300 sq. in., if a Fox is used, and motor mounts placed 1 in. apart. The tank compartment should be made ¼ in. longer, as the tank will then be 1 in. deep. Moving Fox forward ¼ in. will not change balance as motor is lighter and has shorter propeller shaft. Tank will then hold enough for a five minute run. It should be possible to hold the weight to 20 oz. or less with a Fox engine and a 300 sq. in. wing.

The peculiarly shaped fuel tank permits mounting the K & B Allyn .35 very close to the wing LE and still carry enough fuel for a five minute run. It also combines its drag with that of the motor, reducing frontal resistance. It has been proved through experiments that a ship corners better if the motor is mounted close to the LE. Many designers have therefore placed all, or part, of the tank in the wing, but in doing so have made a sacrifice in structural strength as well as admitting the risk of a leaky tank in this strategic location. This tank functions perfectly and the fuel has a very short travel distance to needle valve, cutting down on problems caused by fuel turbulence.

Forward facing fuel vents give better motor runs on all shapes of tank. Motors will have to be peaked a little leaner before launching. Other advantages of side-mounted engine and tank include: 1. motor mounts less apt to be torn loose in crash as motor is more protected from either right-side-up or inverted crashes; the spinner takes the shock instead of the cylinder head and much less leverage is exerted on motor mounts; 2. weight is moved to the right side of ship where it eliminates the need for additional weight in the wing tip when combined with a shorter span on the right wing. Controls also have been installed on right side for this reason.

Note that, since this ship has been designed for long life, bushings are used on control horns and the hinges made in groups of three and are extra strong (see plan). Stiffened nylon petticoat material was used in the hinges as this material is fully as strong as regular linen and not nearly as thick, making a cleaner airfoil. When hinged in groups of three instead of two, you will find it much easier to line up the LE of flaps and elevator with their respective TE's. This is very important in reducing drag. Remember, your ship will be only as tough as its weakest part and at a contest faulty controls or torn hinges can eliminate a ship about as easily as a broken wing or fuselage. You will actually save



time by building carefully as you will not have to build as many ships to be a top competitor. This ship will have from three to four times the life of the average combat job.

Now for construction. First, assemble the framework of the wing. Install 1/16 in. balsa bottom planking over ribs No.'s 1 and 2 and install two-piece plywood bellcrank floor and ⅜ in. balsa brace between left side of No.'s 1 and 2. Drill hole for bellcrank. Remove circle of balsa so bellcrank washer will draw up directly on underside of plywood floor. Now set bellcrank, leadouts and flap pushrod, making sure there is no bind at plywood rib No. 1 and that leadouts move freely through widened holes in left side ribs. For greater durability, lubricate bellcrank moving parts with a graphite paste and solder bellcrank nut. Plank top of bellcrank compartment with 1/16 in. balsa extending planking on lower right side to rib No. 3 for strengthening weak spot caused by pushrod cut-out.

In the wing planking, only one seam will be required if you use medium balsa, 1/32 x 6 x 36 in.; if 3 in. width used, two seams. The seams can be sealed with either Pliobond or regular cement before material is bonded to wing frame. Seams are made on a flat surface over wax paper. When regular cement is used, be sure to coat edges once and dry. Then, while second coat is still wet, butt-cement together over wax paper. No pins are necessary here as the cemented pieces are so thin your adhesive will dry very quickly as you hold the pieces in your hands. With Pliobond, simply coat both edges, let dry to tacky texture and press together. This bond, however, being flexible, acts somewhat as a hinge and makes final planking a little harder to handle, but Pliobond does not warp the 1/32 in. edge while other cement does. Smoother airfoil results when Pliobond is used.

Brush bottom leading edge of wing and front underside portion of planking with two thin coats of Pliobond each. When surfaces have properly dried, lay planking on flat surface and carefully place LE of wing on coated planking. Press in place by hand. Now, with Pliobond, coat ribs and underside of planking where ribs and center section join to about half-way between LE and TE across full span. When dry, bond together. Follow same procedure from center of chord to TE, to avoid too much drying time which may cause a poorer bond. Note that while 1/32 in. balsa is very flexible and takes cement easily while holding frame and planking apart, you must make sure parts remain separated until you are ready to join them. Top of wing is planked in same manner except for slit in planking from pushrod to TE. If joints appear to loosen in spots, work more Pliobond into crack, dry and press back together. Now trim excess planking, sand and square up TE. This edge should be ⅛ in. thick. Cement wing tips and shape.

For the rubber wing mount, cut piece of 1/16 in. thick inner tube rubber ⅞ in. wide by 16½ in. long. Pliobond in place directly over center rib No. 1 all around the wing except for square TE. Double-coat this bond, as it is the heart of your tough construction. Now on 1/16 in. hard balsa, apply a double coat of Pliobond in a strip 1 in. wide, all around the wing, with grain running span-wise, extending to the rubber. This will later be cemented into fuse wing cut-out.

Now we're ready to tackle the fuselage. Select two pieces of lightweight straight grain white pine, ½ x ½ in., and taper from thickest part of airfoil both ways to rear of fuselage. Cement in place to both top and bottom of ⅜ in. hard balsa wing support and rear fuselage piece. As these pieces are bent slightly toward the rear, they can be held in place by wrapping with flexible wire until cement dries. Now install pushrod wire braces behind tank compartment. Counter-sink these parts so plywood side will fit flush. Sand perfectly flat and shape to rear taper. Wing cut-out in balsa should be made before sides are attached. Wing cut-outs in plywood sides can be roughly cut and trimmed after bonding. Double-coat the plywood sides and fuselage sides with Pliobond and press in place. Tapping or rolling these parts will make a tighter bond. Now cut away extra plywood at tank and motor openings. Round off top and bottom and taper rear of fuselage to point. Now add the white pine nose block and spinner ring and notch K & B Allyn .35 motor in proper place. Drill and firmly mount blind motor nuts; also, tank hold-down nuts. Soft balsa cowl block is installed after wing and fuselage are cemented together. Front assembly is later covered with silk for extra strength. This block and spinner ring, although optional, contributes a great deal to strength and streamlining.

Flaps are made in usual manner from hard ⅜ in. balsa tapered to knife edge and 3/32 in. spring wire, reinforced with cloth, joins them together. Rudder is countersunk in top rear of fuselage and made from 1/16 in. hard balsa, placing grain for maximum strength. The stab being rather small (for quick cornering) should be of very hard balsa and the elevator medium hard tapered to knife edge. Horn is cemented in place and a piece of balsa goes over this for extra strength. Stab is bonded in sawed-out slot with Pliobond for flexibility. Apply coat to slot and stab and let dry. Put fresh coat on stab and

(*Continued on page 42*)

LOOK! 2 MORE
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SCIENTIFIC
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HALF-A FANS! Here's real hot news for you! Two (2) more sensational $1.19 U-Control models . . . the newest, hottest series we've ever produced. Dealers throughout the country tell us they're going like "hot cakes."
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$1.19 EA
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Authentic scale model . . . prefabbed for quick, easy assembly. Has a carved fuselage.
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Economically priced U-C model. Prefabbed parts include: formed balsa fuselage & wing.
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SPAN: 16" For .020 to .074 Eng.
Carved balsa fuselage bi-plane, prefabbed for easy assembly. It's control-line. A real value!
PIPER CUB CRUISER $1.50
SPAN: 18" For .035 to .074 Eng.
All prefabbed, carved balsa fuselage model. It's scaled after the world famous "Cub."
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Deluxe U-Control model. 100% complete—with carved balsa fuselage, wings, etc.
SPORT RACER $1.50
SPAN: 18" For .020 to .074 Eng.
Good U-Control performer at a remarkably low price. Completely prefabbed kit. Easy to fly.
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A "beaut" of a speedboat. Prefabbed with a carved balsa hull, brass fittings, etc.
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Popular Chris-Craft runabout . . . all prefabbed, carved 12" balsa hull,, metal fittings.
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Here's our sleek cabin cruiser, with a removable cabin, 14" carved balsa hull etc., etc.
XP-300 DREAM BOAT $1.95
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Our exclusive aeronautical design. Prefabbed model has 12" carved balsa hull, etc., etc.
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slip stab into the slot while still wet. The bond really holds and stays flexible. Note: make sure your controls have been properly neutralized before permitting this bond to set. Do this after wing is cemented in place and controls have been properly set.

All of which brings us to final assembly, covering and finish. Carefully fit wing mount to fuselage opening. Cement in place as you would a normal profile. The rubber will compress slightly so fit snugly for best cement joint. This joint will not give trouble as all shock, strain and vibration will be absorbed by the rubber. Be sure flaps are in place before wing is cemented. Install horn and hinge flaps after fuselage and wing are joined. About two coats of Aero Gloss sealer should be used on wing, stab and rudder and carefully sanded before papering. Cover wing and flaps from fuselage outward to tips with colored Silkspan over hinges. Carefully cut along flap with razor blade. Do not cut hinges. Stab and elevator are covered over hinges in same manner but done before mounting in fuselage for neater job. Rudder is also covered before mounting in slot.

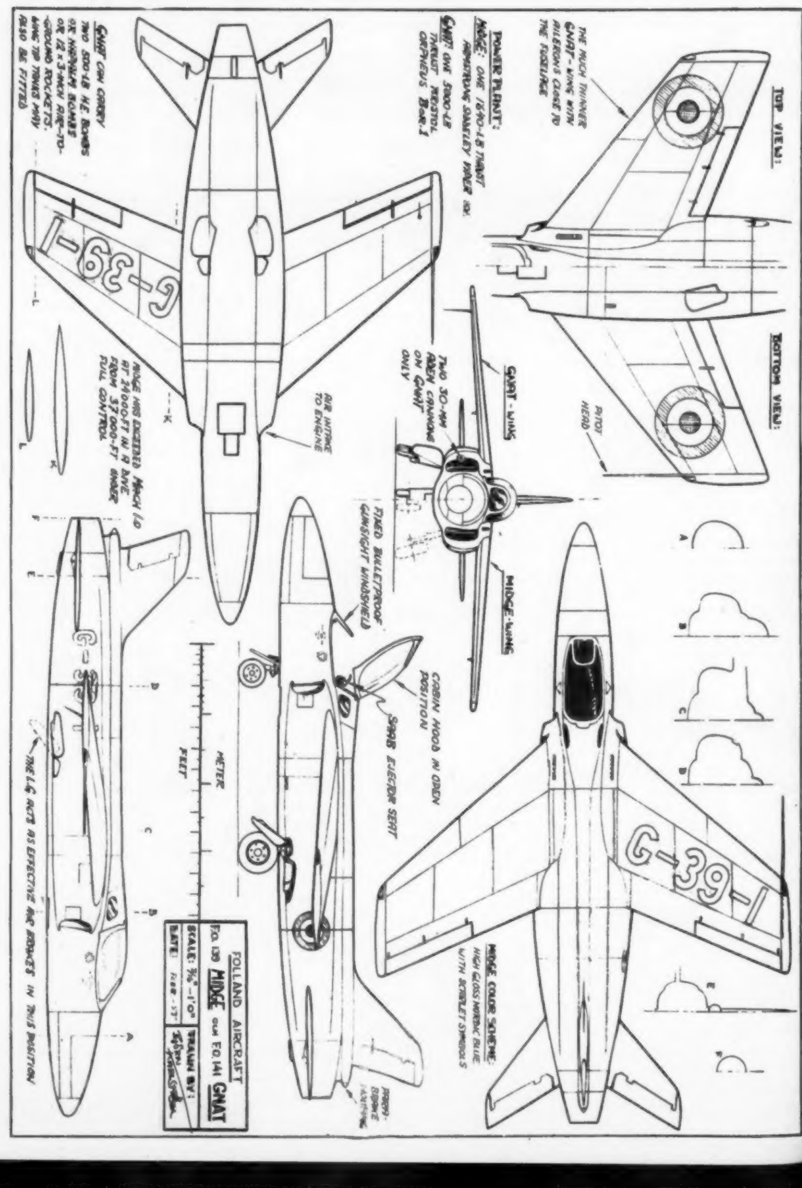
Do not over-dope your model as Silkspan-covered wood requires much less dope to seal than paper over regular framing. About three or four thin coats of clear fuelproof dope should be enough for a smooth finish over the paper. A rough skin definitely causes drag, so make sure it is finished very smoothly even if it does not shine. The fuselage is covered with silk at the front end only. Go easy on colored dopes as they add unnecessary weight. With this ship as your weapon, your trophy case should fill up, so let's get with it.

Solid Tiger

(Continued from page 22)

deliberately omitted the landing gear details but door wells should be outlined in pencil or black ink to make the model more realistic.

This is really a very simple model to build but everything depends on the finish if you want a first class job. Treat the whole works with plenty of sanding sealer, sand smooth after each coat and then apply two or three coats of thinned dope and sand down again and again before giving the model its final finish. Insignia can be picked up in decal form from your local hobby shop.



Engine Review

(*Continued from page 34*)

of using a reed type valve. That minimum size, in relation to engine size, is big and clumsy, and there is no obvious way of altering that fact. Therefore, we have to compromise with our desires in the way of engine configuration in order to enjoy the extra steam the reed valve has made available.

If the valve assembly has to be at the back of the engine, then the carburetor assembly must also be there. This brings us to the old deep-rooted objection to disc rotary valves which had the same requirement; the same steps are being taken with the reed valve as with the disc valve to overcome that objection. Carburetors are made to stand up vertically behind the cylinder and the air or mixture has to go around a right-angled corner to reach the valve. Unfortunately, this again is a compromise with efficiency, as any deflection of the charge must inevitably impede its flow with consequent loss. Therefore, we come to the reluctant conclusion that, if performance is of paramount importance, then we must accept a reed valve engine with the carburetor sticking out of the backplate and adapt our model design to suit. The Cox engines are based on the assumption that performance is of paramount importance and they certainly justify their aim.

The only apparent difference between the Space Bug and Thermal Hopper reed units seems to be in the reed itself. The Space Bug had two laminations with a thin one against the valve seat and a thicker one to give it resilience. The Thermal Hopper has a one-piece reed.

The carburetor is unique among current production engines and utilizes a principle which was successfully used by Stanglin and Clem on their McCoy racing engines, but is developed to the extent where it is more flexible and less demanding as to accuracy of needle setting. It consists of an intake with a properly contoured venturi with three minute jet holes drilled around the periphery of the choke. On the outside of the intake there is an annular groove which registers with the three jet holes. A closely-fitting collar around the intake butts up against a shoulder and is retained by the screwed air filter assembly. This collar incorporates the jet proper and the needle valve, with a hole which communicates with the annular intake groove and thus supplies fuel to the three secondary jets. The collar assembly can be rotated to any desired position by slackening the air filter.

The advantages of this type of carburetor are twofold: first, it contrives to introduce the fuel into the incoming airstream with far less turbulence than a spraybar and, since turbulence impedes airflow, it consequently allows a little more mixture into the engine for the same crankcase displacement; secondly, since the fuel is introduced at three points instead of one, the diffusion of the fuel into the air is more even, although it is doubtful if any gain is derived in this engine because the reed valve itself is a very efficient diffuser.

The entire valve and carburetor assembly are beautifully made, as indeed is the whole engine, and since the engine mounting plate is integral with the valve assembly, it would be a comparatively simple matter to fit the whole unit to other larger engines in place of their regular rear crankcase covers. Judging from the performance of the Thermal Hopper, there would be no point in fitting it to another engine of similar displacement.

In all other respects, the Thermal Hopper is identical with the Space Bug and features interchangeable pistons and cylinders, integral plug and head for the same price as most regular glow plugs, counterbalanced crankshaft and dual exhaust and internal bypass ports. The only exception is that the shaft now runs in the cast crankcase material, in common with most Half-A engines, instead of in a bronze bushing.

Four engines were used in this test of which two had been previously run at the factory with the object of demonstrating the rapidity with which these engines come up to full power. A test is far more accurate an assessement of the abilities of the design when the average results of several examples are taken and we are especially fortunate in this case in having previous Space Bug figures for comparison. The racing kit for the Space Bug made a very considerable difference to top end performance and since the Thermal Hopper air filter and intake are similar, it is interesting to see the gain which can be attributed to the multi-jet carburetor.

Operation and Handling

The Thermal Hopper is extremely easy to start and, if you practice, it will respond literally on the first flip after the right amount of exhaust prime and choking. The instruction leaflet deals thoroughly with this subject. However, on small props it is a matter of luck as to which way the engine will run when it does start and until one acquires the knack, it will usually start in reverse. Reed valve engines will run in either direction with equal efficiency and so unlike many engines will not reverse themselves when they fire in the wrong direction. A really hearty flip is usually the solution to the problem.

Smoothness is the keynote of the Thermal Hopper and the improved performance over the Space Bug is probably helped considerably by the rigidity of the large mounting plate. The needle control is delightful, being absolutely positive and

progressive, and avoidance of unnecessary twiddling will help to keep it that way.

Performance

After five minutes' operation, the two factory-run engines were within 100 rpm of one another and the stock unrun engines were at the same pitch within 20 minutes. After a similar time the factory engines had noticeably improved and one of them kept on gaining until we tired of the noise after some 50 minutes. All these engines become quite loose after sustained high speeds but this looseness seems to reach a certain level and then maintain it for an indeterminate period. One very gratifying feature of these engines seems to be that no matter how hard or long they are run, restarting is excellent and compression remains at a high value.

TEST: Cox Thimble Drome Thermal Hopper .049

Plug: Integral with head; 1½V to start; *Fuel:* Supersonic 1000; *Running Time Prior to Test:* Average 40 minutes; *Bore:* .406 in.; *Stroke:* .386 in.; *Weight:* 1.2 oz. The following results are average of four engines, two with factory pre-run;

Power Prop	*RPM*
6 x 5	12,000
6 x 4	13,650
6 x 3	16,400
5¼ x 5	15,050
5¼ x 4	18,000
5¼ x 3	21,200
Top Flite	*RPM*
6 x 5	11,700
6 x 4	15,150
6 x 3	15,150

Radio Control News

(*Continued from page* 25)

will result when this chemical is used in conjunction with ammonium hydroxide, which you can get at the drug store.

Fig. 1 shows how this form of smoke production can be maintained and controlled in RC flight. The venturi should be made of plastic or molded from Fibreglas. Absolutely no metal should be used in the system and the unit should be mounted away from the engine or cabin, because of the corrosive action of the smoke. The tubes leading from the individual chemical tanks should be plastic, like the tanks themselves. We have just begun work on our unit and do not have all the bugs out of it yet. However, it does show great promise and the idea is passed along for your evaluation. Venturi design is of great importance, as is the placement of the chemical tanks. Control of the smoke may be effected by restricting the input of the venturi or by a fuel shut-off feature in the supply lines.

Several letters recently received refer to the lack of conduction in the second stage of our two-tuber. Unfortunately, no mention is made of the type of tube used. Triggering action does not occur until the first stage plate current falls below .1 ma. This means that there is still a certain amount of AF hiss level leakage getting through to the grid of the second stage, thus preventing conduction. A remedy for this problem could include one of the following changes: decrease the size of the coupling capacitor from .005 mf to .003 or .002 mf; or use a high value of grid leak resistor on the grid of the second stage–something from about 4.7 to 10 megs, connected from grid to ground.

The popularity of our two-tuber suggested that you might like a recap on various designs of the coupling network. To begin with, the main objective is to utilize the hiss level of the first stage to provide a bias for the second tube, thus preventing the flow of plate current when no signal is being received. Originally,

this was done by coupling the audio hiss of the first stage, through a capacitor to the grid of the second stage. If the second stage was a gas tube, there was no trouble in cutting off the tube. However, if a hard tube were used in the second stage, it required a higher idling current on the first tube to cut it off. Even then, the plate current was not always zero when no signal was being received.

Various voltage-multiplying circuits may be used to increase this hiss level voltage and also to rectify it, thus allowing a low idling current in the first stage and the use of a hard tube or transistor in the second stage. This operation is based on the use of a gas tube in the first stage, since the random noise generated by the super-regenerative action is more pronounced than in hard tubes.

If a hard tube is used as the first stage tube, the hiss level must be amplified up to a level comparable with that of the gas tube. This is done with a small audio transformer, the output of which may be fed to a voltage multiplying and rectifying circuit, prior to going into the grid of the second tube. Fig. 2 shows various ways this two-tube operation may be accomplished. Sketch A gives the circuit as originally designed, using two gas tubes. Sketches B, C and D show voltage doubler, tripler and quadrupler circuits. Theoretically, the increase in voltage is approximately 2.8 for the doubler, 4.2 for the tripler and 5.6 for the quadrupler. This is the RMS value of the AC input voltage. Many circuits can be worked out with small diodes which will eliminate tubes, thus making for a more compact and efficient circuit. They are virtually crashproof, their main enemy being too much heat during the soldering operation.

Just when we had high hopes of giving you the complete scoop on pneumatic actuators, as described by Geoffrey Pike of Nottingham, England—Geoff left out the sketches. More on them in a later issue. Meanwhile, we thought you'd like a brief description of how the system operates and some of the pertinent features of such a system. The pneumatic type of actuator derives its power from either a vacuum or a pressure-creating device. Apparently, both methods have been tried in England and in Germany and the vacuum system is still tops. Incidentally, Kurt Stegmaier of Germany is the developer of this system. The main features of this vacuum servo actuator system are its high shock resistance, ultra-light weight and more than sufficient power. An English unit developed enough pull to resist stopping of the output shaft, by tight finger pressure, when the unit was actuated by sucking-in on the vacuum tube.

In a pneumatic system, whether it be by vacuum or pressure, the main problem is in valving. For single-channel work, a simple lightweight stepping relay on a midget escapement has been recommended. For multi-channel work, the receiver relays themselves may be used to operate a valve. How do we get the vacuum? This can be done by tapping into the crankcase of the engine or by running a small bellows or a piston-action device from either the main engine or a small electric motor. What happens when the engine stops? Mention has been made of a bicycle-type of pump, used in reverse. In fact, anything that acts as a vacuum reservoir will do the trick.

Sure hope Geoff gets the sketches over in time for next month's column. In the meantime, you might give this idea some thought for spring or summer action. It is a tried and proven system in England and Germany so it is reasonable to assume that we can do the same here, too.

NEW ITEMS

For those of you who may have missed it, the C & H Sales Co., 2176 E. Colorado St., Pasadena 8, Calif. had a fine ad in the January issue of MAN. Two of many fine items included a Potter & Brumfield hermetically sealed 9,000 Ohm relay for only $2. The other item is one that is rarely, if ever, seen. We are referring to the motor driven servo used in the OQ-2 drone plane. Two 2-6 volt motors drive the actuator levers through precision gear trains and the current consumption is very low. We don't see how you could possibly go wrong on this item for only $8.

Cheers for the RK-61, back again and better than ever. Well, at least it's better than it had been for quite some time. The new production run of this tube commenced around the end of 1955 and we are happy to report that the tube now compares very favorably with those produced about a year and a half to two years ago. A considerable number of them, when tested, had excellent life and were found to be more uniform in their characteristics and more sensitive. One tube, used in our two-tube diode circuit, was still functioning after more than 275 hours of *continuous* use. We hope the manufacturer keeps up the good work on this tube, thus enabling the circuit designer to be more specific with his values.

CG Electronics Corp. of Albuquerque, N. M. has announced quite a few "parts packages" for their various receivers and transmitters. The two- and three-channel reed conversion units have also been reduced in price and a five-channel transistorized receiver package is only $32.95, less reed and relays. Write to them for their new order blank and catalogue sheet.

Newx Products Co., Box 643, Union, N. Y., makers of the Newx escapement,

send word that any of their escapements will be adjusted free of charge; that is, *if* the unit ever requires adjustment. Tests on a special robot unit indicated a life span in excess of a half-million pulses. This didn't even approach the end of its useful life, but it did represent a "flyable" life of more than 1,000 flights. Incidentally, this test was performed with 3/16 in. rubber powering the escapement. Next month, we'll present a circuit with the Newx escapement for transistor use—no relay needed.

OVERSET—Radio Control News

Last minute memo that RC Club of Detroit (Ernie Kratzet, Box 5197, Grosse Pointe 36, Mich.) is having its Second Annual Mid-Winter RC Convention on March 3 at Rouge Recreation Center, Rouge Park; open from noon to 11 p.m.; all RC fans welcome. Program: discussion, talks, demonstration of new equipment; rules; Contest Calendar; bull sessions; two-hour RC movies, including 1955 Nats in color.

Foreign Notes

(*Continued from page* 33)

South African expert Pete Visser thinks that the rules should stay as they are for the time being and points out that the 1955 event was held in exceptional air. Pete describes his 1956 Wakefield, which will have a long, slim fuselage and a 20 x 22 prop. He favors a sheeted streamliner as a possible line of future development.

Unlike those of so many countries, South African modelers are in the happy position of being able to choose modeling equipment from both hard and soft currency areas. As far as motors are concerned, South Africa has mostly favored American imports. In the now-popular .15 class, however, European Diesels are claiming some attention and Pete Visser tells us that the German Webra Mach-1 is now well in the picture and, on the popular Tornado 8 x 4 prop favored for free flight, has the edge on the Torp .15 for performance.

Japan: Expanding Interest in Model Products

The speed with which some elements in the Japanese model industry are introducing new and remarkably good model products is quite an eye-opener. It should not cause undue surprise, however, because some idea of Japanese ability has already been shown in that country's post-war manufacture of high-precision miniature cameras capable, in the opinion of many expert photographers, of competing on equal terms with famous German products.

In particular, we have been impressed by the progress made, during the past year or so, by the Ogawa Co. of Osaka, which has introduced three new OS Max-1 engines, plus the OS Minitron radio gear. The Max .29 and .35 have already claimed some attention in the U.S.A. and the .15, which we have also recently tested, we would place among the top four .15 cu. in. glow plug motors in production in the world today.

Germany: New Webra .15 Glow Expected

The next engine expected from the noted German Webra concern is a glow plug .15 aimed at World Championship honors. Designer Gunther Bodemann actually had a prototype of this engine running before the 1955 World Championships and, although it was not used at that event, we were told that, on test, it had reached an output of .37 bhp, which, by way of comparison, is about 35 per cent better than a stock Torp .15.

Cuba: Dyna-Jet Cougar Makes TV News

At Columbia Cuban Army Air Force Base, Bruce Eglington has been flying a 35 in. scale Grumman Cougar powered with

a Dyna-Jet. Model flies well and fast and Tony Alvarado says that he thinks it is the first jet-scale job to be flown in Cuba. Does anyone disagree? The model's first flight was filmed and was afterward shown on television.

Indonesia: Miscellany

We have some news and photographs from a correspondent in Indonesia, Mr. K. Hartono of Bandung, concerning modeling in that country. It appears that the model supplies, particularly manufactured items such as motors, are virtually unobtainable, but that balsa is quite plentiful, since it actually grows there. The effect of this on model development is that the majority of modelers concentrate on towliners.

However, we noted two exceptions in the photographs: a neat controlline F-86D Sabre built by Mr. Menicks of the Aviantara Model Club and an unusual .29-powered controlline pusher original built by Lieut. Soebagio of the Indonesian Air Force.

Dunwoody's Nordic

(*Continued from page* 14)

lower keel and formers installed. Note the two doublers at the tail on either side of the lower keel which hold the auto-rudder bearing in place and reinforce the tail. Bend the wing, tail hook and tow hooks and install; cover with gauze and recement all joints.

The lower part of the fuselage may now be covered with soft 1/16 in. sheet balsa, grain running lengthwise. As 36 in. wood will not cover this length in one piece, a splice should be made near the nose. Before covering the lower part of the nose, place a large amount of lead into the section ahead of Bulkhead A. Trim the excess sheet to allow the upper sheeting to overlap it.

The upper portion of the fuselage may now be sheeted, starting at the wing saddle and working toward the tail. Care should be taken to assure well-cemented joints at all formers and keels. The joint between the sheeting and the fin should be coated with cement several times.

The tail end of the fuselage should be finished before the nose is covered to allow weight to be installed in the nose for balance. The .060 wire for the auto-rudder hinge should be bent and placed in the bearings. Cement the rudder to it and fit the gauze hinges. Cement the hinges well but be sure the rudder turns freely. Cut the brass strip to shape and bend the .020 music wire spring. Assemble them to the lower end of the auto-rudder pivot wire (see plan) and solder well. The loose end of the spring should be cemented to the side of the fuselage next to the sub-rudder.

Now the horn may be shaped. The plans call for aluminum and this is preferable; however, magnesium, plastic or even hard wood may be used instead. The three holes are tapped for No. 4-40 screws and the horn is mounted on the rudder as shown. The fairing block should now be cemented into place and carved to shape.

Mount the stabilizer on the saddle and add lead or clay, or even both, to the nose until the fuselage balances at about the 40 per cent chord point. Now cover the remaining portions of the fuselage and remove the stabilizer.

Lightly sand the entire fuselage, removing bumps and slightly rounding off the corners. Double-coat the fuselage with dope and cover with Skysail or Silkspan and complete doping operation. This leaves us ready to consider the towline as a preface to flight.

The towline should be made of nylon fishing line (monofilament or braided) of at least 20 lb. test, or stranded steel cable. I use the steel line (.012 diameter, seven strand) and find it permits much better control of the model on the tow than the more elastic nylon, but the higher cost of steel and the importance of careful handling keep it from wide usage. The auto-rudder release hook is bent from .032 wire in the form of a Figure Eight with both loops about ⅛ in. in diameter and tightly closed. This hook is fastened to the very end of the towline. The tow hook is also bent from .032 wire in the form of an Eight with one loop of ⅛ in. diameter and the other of ⅜ in. diameter. The ⅛ in. diameter loop is fastened to the towline about 30 in. from the end in such manner that will prevent slippage. A piece of cloth—light cotton or silk—is fastened to the towline about 1 ft. below the tow hook and the line is complete. It should be carried on a reel and kept in good condition. Any frayed sections should be removed immediately. Waiting until the line snaps during a tow would be a trifle late.

No doubt you want to see whether the product of your building energies can really fly. Well, it certainly can! Hand-glide the model with the auto-rudder straight. The stabilizer incidence is varied to obtain a straight glide with a very slight stall. Release the auto-rudder and adjust it to glide the model in a circle about 50 ft. in diameter.

For the tow, use about 50 ft. of line. The auto-rudder release hook is placed over the pin and the brass strip slipped over it, holding it in the place; then the tow hook is placed on the middle hook and the model towed into the wind. Adjustments should be made to the auto-rudder fan both tow and glide until a straight tow and a flat, tight turning glide are obtained. If the model shows a tendency to turn violently from side to side during the tow, weight should be added to the nose and the stabilizer incidence decreased until the oscillating stops.

A word of warning may be in order here: never fly the model without using the dethermalizer. Towliners have a habit of picking up the weakest thermals and going out of sight on them. The original model hooked a thermal on its second test launch and drifted ten miles across New York Harbor from Brooklyn to Bayonne, N. J. because we forgot the matches. The dethermalizer has been very active on every flight since then.

Notes on Multi . . .

(*Continued from page* 30)

characteristics, or the pros and cons of Mark I, a few general comments on multi-flying technique should be made.

Debate exists over the merits of trim servos versus self-neutralizing servos. A couple of years ago all elevator servos were trimmable (without self-centering) but a series of so-called death dives, coupled with over-controlling troubles, led to a divided opinion and the self-neutralizing servo types. The fatal dives more recently were pinned on a mechanical jamming action because of air loads on the flippers; this mechanical shortcoming on one make of trim servo was corrected in later self-neutralizing types.

So far, we have not had this trouble from our trimmable servo. You do have to get used to the control response for a given duration of control application. This varies with control surface efficiency and with type of airfoil. On the Mark II plane, the stick was jabbed, not pushed, and never grasped. Even with small flippers an attitude change was instantly noticeable. You have to anticipate, applying down while up is still building, as on a pull-up out of a dive. At slow speeds, as in the approach, the stick might be given repeated half-second applications. One test flight, with rudder inoperative because of improper area and inadequate balancing, the ship had to be saved from a straight down dive after a complete stall with a roll-over at the top. The resulting hair-raising roller coaster was ironed out by trim alone and the ship flown purposely onto the ground at a slight angle for a power landing. On rudder alone, the plane would have flown away or, more probably, struck the ground. Generally, in tight spots, the elevators were returned to some in-between position and rudder-only technique resorted to with subsequent resetting of trim.

Multi flying reminded us keenly of early flights with Jetex-powered models. How so? Any warp, anywhere, however minute, on wing tip, stab tip, fin LE, is absolute poison. A warp has varying and increasing effects with changes in air speed. The Jetex model with a warped surface may start out levelly but end up spiralling-in or even rolling, as it accelerates. The most distressing problem with the Mark I airplane was a tendency to turn left at slow glide speeds and right at dive speed. At only one speed would it go straight; anything else caused anything from a slight loss of heading to an incipient spiral. Torque has a varying effect, as it does on real planes. At slow speed, nose up, torque has a pronounced left swing tendency; at high speed, torque is relatively unimportant. So directional stability is a problem even with correct design—and this one was faulty in some respects at the beginning. It is difficult to pin a directional fault on a warp or on torque, if the warp is small.

Rudder effect varies with speed, as rudder-only people know. But here, the variation is pronounced because by means of up-elevator and low motor, the plane can be dragged through the air or, by slight down and high motor, it can be dived or cruised flat at quite high speeds. Fin area

and rudder reaction must satisfy low speed maneuvering. Variations in rudder effect are much greater than with rudder-only. Dragging turns close to the ground command a rudder that becomes amazingly lively when the ship is flown flat out. Normal (rudder-only) rudder reaction leaves marginal control under trying conditions, especially cross-wind, as when turning from a bad launch before the ship dared be trimmed out.

Elevator effect varies also. One approach may be flared out beautifully but the next, perhaps at a faster glide speed, may balloon your heart into your mouth. Consistency in pilotage is paramount at all times. Recall thinking that rudder-only had been like knocking the plane out its flight path every time you squeezed the button, with inherent stability righting it again, almost as if one created a series of minor emergencies to achieve control with respect to terrain.

On the credit side, Mark I was an easy airplane to launch. Despite its weight, it could be laid on the air in a few steps. It cruised leisurely, unless trimmed out, when it covered ground with agility. That's another intriguing thing. With a multi job, you reach the confines of the field quickly, so you hardly get squared away before you come zooming back again. The only way to watch and enjoy steady flight heading for a decent time interval is to fly quite high. This is another reason why receiver sensitivity is a must. Without thinking, you drift into ranges you'd never think of on rudder. On multi, one's mind must be completely at ease. Range limits should be so great that the pilot can be freed of subconscious concern in order to concentrate on his flying without making compromise decisions.

On the debit side, Mark I had some puzzling problems. Despite 7° dihedral, it seemed marginal in spirals. With the fast, heavy big airplane, a spiral apparently builds up inertia through centrifugal force that can overpower a rudder (not the usual aerodynamic business of airloads and balance areas, but simple brute force), unless the rudder has a very powerful reaction. A turn tendency in a dive, coupled with an intentional turn in the same direction, especially with a warp, can put the plane beyond the ability of the rudder to recover. The horrifying thing is that up-elevator only makes the spiral tighter and worse. It may not save the airplane. Where spiral recovery is marginal, the elevator has to be used before the degree of bank becomes steep. Mark I pointed up the need for an airplane that could be counted upon to recover from a spiral when left alone. One wonders, therefore, about these low dihedral jobs! Mark I was taken out of some emergencies by slight down, not up, elevator! Down would cause the spiral to become a widening turn and presently the rudder could again overcome the centrifugal force to roll out the airplane. To do this, you must have altitude! Warp was involved because the headaches were limited to right-hand spirals.

The fin area was reduced, a la free flighters' argument that big tails cause wind-ins. Maybe they do. But a small tail is worse. With each cut in vertical area, the ship required more and more pilotage on turn recoveries and it was extremely difficult to get lined up after such a recovery. Directional stability was shot, except at high speeds. Again, fin area must be designed for slow flight. If this area is too great for high speed spirals, dihedral, profile, CG position, or any other factor or theory you have should be combined with this fin area to insure recoveries without having to fly the plane out. On both Mark

I and II, the Walker pressure tank was insufficient because a rich mixture would quickly empty the tank. Two tanks would be needed with such two-speed mixture setups in a .29 or .35. Mark III used the Bramco throttle, a considerable improvement.

The Clark Y airfoil appeared unsuitable for a wide speed range variation, at least on this airplane (Mark I) and with the normal angular difference between wing and stabilizer. In a steep dive, lift built up quickly until the ship tried to break out of the dive, with the flippers fighting to hold it to the dive path. The result was more like a hammering than a buffeting of high frequency but small amplitude. The same lift build-up required three to four applications of down (additive on a trim servo) before flat cruise would be maintained. Each application of down would begin a slight dive, then change to level flight and finally back to a climb, albeit faster and less steep.

When major damage was sustained (magnetized escapement from too much voltage: the receiver was untroubled by fantastic abuse), the ship was replaced by Mark II, picking up the same nose and cabin with gear intact. Now the NACA 2412 replaced the Clark Y. A lighter wing loading was achieved by an increase in area. A smaller angular difference was employed. With convex undercamber and fully symmetrical sections, the writer has frequently found desirable angular difference of 1° maximum. If the symmetrical section is to insure the same characteristics inverted as right side up, it follows that 1° positive decalage right side up is 1° minus inverted. The bigger the spread, the greater the difference in handling when the plane goes inverted. This, of course, depends on the downthrust present (up, when inverted). Downthrust matters because speed changes in combination with propeller pitch variations, produces infinite variations.

The third and largest fin from Mark I was supplemented by a dorsal fin. The stabilizer was lowered on the chance that downwash from the wing might have been involved with Mark I. Mark II proved very stable and responsive close to the ground. With pronounced up-elevator, it could be dragged around in steeply banked eights, right on the ground. Its roll with turn was perfectly coordinated. It could be tucked under reasonably soon in the dive—despite small flippers, according to modern trends—and could be pulled up into a fairly tight loop. The 2412 made trimming easy. The ship stayed where aimed on one trim application. Longitudinal stability was excellent because of the small center of pressure travel of the section and the elimination of the old lift build-up troubles on Mark I. But now the ship was just a little bit wingy and proportionately awkward in those hairy close-to-the-ground deals every pilot occasionally gets into when something goes wrong, such as an unexpected motor speed change. Launching was tough on a hot day even with considerable up-elevator. In fact, it is anticipated that the MS Special Fox .35 will make up for the added drag that resulted from the big increase in wing area (also thicker section and wider average chord).

Mark III resulted from an attempt to reduce weight and drag to make the plane lighter on its feet and fully stuntable. The span was reduced to 6 ft. However, the decreased wing area offset the weight cut to come up with the same wing loading as Mark II.

Power loading, however, went down to 342 oz. per cu. in. Big flippers were installed although their movement is still limited pending solution of vibration interference problems. On the few test flights made to date, it would appear that the standard Fox .35 is too lively for the Mark III. Being smaller, the ship is more subject to vibration than Mark I and Mark II, which were smooth in that respect. Very noticeable is the bad effect of sheet balsa construction in Mark III which permits the fuselage to drum or be a sounding board. The open construction of the earlier jobs helped subdue vibration. Careful balancing of props and thorough grounding of metal parts is a must on a plane this powerful. Basically, Mark III is a ship worth building. Like the earlier jobs, it has had a number of alterations resulting from flight experiences, such as wing position, angular difference, CG position changes.

If the series were to be projected, the airplane might be lightened further. It is light enough now, as the designer's ideas of lasting ability are concerned. This has been proved by a moderately steep dive-in on hard ground, which broke only the prop. Any light radio installation you might achieve would have beneficial results.

With all three models, the heaviest battery complement was carried, consisting of three intermediate cells for the servo and escapements and two intermediates for the filament. B supply was the K-45. It is practical to operate the Babcock with hearing aids. Tests with four pencells for filament and six for actuators indicated that filament was most demanding. Five simulated flights of five minutes' duration with 10-minute rest periods were about all that could be counted on, using four pencells bought over the counter. Hearing aid pencells would perhaps improve this.

Although Mark I was the least maneuverable and most tricky, it was the most interesting to fly. There was the good feeling of handling a real airplane.

Inside Story

(*Continued from page* 21)

are to compete in the new indoor tissue event in AMA, we must fly lighter aircraft. This means indoor balsa and small rubber. We are looking for ideas on where to buy the stuff. (Incidentally, Sig Manufacturing Co. of Montezuma, Ia., handles indoor wood; trade name, Contest Balsa.)

Lack of Interest—This can be overcome by having frequent regular flying sessions, so that it isn't a one-shot-a-year deal. At least one good contest during the winter. This could be repeated by other towns and a regular indoor contest season set up. ("Oh, no!" I hear the wives shouting.) Also, a variety of events keeps interest up.

We're just talking among ourselves, so this is sort of off-the-record, and we thought we'd like to see how our type of contest goes in other areas. Then, if enough interest were shown, the more popular of the new events might be tried in the AMA schedule. Also, we would like to see someone within the model industry pick up the ball and boost indoor activity. Give attractive prizes—perhaps stop watches. The few bucks invested would be soon returned in publicity and it might well return to indoor flying the popularity it once held.

It's been said that the early 'thirties saw the Golden Era for indoor and, in all of model flying, it was King. How about joining us in recapturing some of the Old spirit?

Pen Pals

► Warbles from the Golden West must have triggered this pen friend request from Ivor Clarkson Hull, 15 Ryde St., Beverley Rd., Hull, East Yorkshire, England, who is especially eager to contact modelers around the age of 20 from the State of California; stress on scale . . . Share your aero-modeling joys and problems with: Graham H. Lewis, 216 Autumn St., Geelong West, Victoria, Australia, 17, C/L, stunt, TR . . . Barry M. Murphy. 13 Rennet Wood Rd., Eltham, London, S.E. 9, England, 18, speed . . . A. A. Wright, Royal New Zealand Rgt., C.D. Training Depot, Waiouru Military Base, New Zealand, scale, FF, U/C, will exchange modeling equipment . . . Philip Bond, 17 Connolly St., Lower Hutt, Wellington, New Zealand, 16, C/L, stunt, TR, will swap

A rare item is offered by Robert Levin of 105 Avenue P, Brooklyn 4, N.Y. in his Junior Brown motor . . . Your Bonner or Babcock Compound Escapement will gain British modeling goods for you from F. M. Fryc of the Polish Air Force Assn., Model Aircraft Club, 21 Larkhall Rise, London, S.W. 4, England . . . If you can help some club members Down Under locate 6-7 ft. wingspan FF or RC models of Cessna 170 or 180; Piper Cub J-3; Cessna Bird Dog L-19A; Aeronca or Monocoupe types, write Bruce Kilmister, "Elgin"—Box 8, P.O., Tullamore 7W, New South Wales, Australia . . . Mark Levinson, 1624 55th St., Brooklyn 4, N.Y. will sell or trade Jetex 50 and 150, plus fuel; also has fabulous hoards of back issues of modeling mags. Write him, or telephone at ULster 1-7436 . . . Diesel engines for gas, offers R. Pattenden, 2-B Sussex Ave., Spring Lane, Canterbury, Kent, England . . . Ask Day Chahroudi, Lake Mahopac, N.Y. about his many engines available . . . Letters and K & B .19 sought by George Brown, 17 Franklin Ave., Pitman, N.J. who offers, respectively, interest in stunt and combat, and an Ohlsson .23 . . . Another pen friend from the other side of the globe is Bryan Stephens, 21 Frederick St., Randwick, Sydney, WSW. Australia.

Skyraider . . .

(*Continued from page* 10)

balsa LE cap strip. The LE is then sanded to shape using rib templates to check for proper contour. Bellcrank platform is then installed in the center section blocking it in on both sides, top and bottom. Next, install bellcrank and lead-out wires. Details, such as landing gear strut fairings, wheel well doors, bomb and rocket racks and flap hinges should be added after finish has been applied to wing. They should be finished separately and then attached to wing and landing gear assembly. The landing gear strut fairings for the original models were formed from 1/16 plastic sheet and attached by means of tin strips soldered to the strut and squeeze riveted with a pair of pliers using 1/16 in. dia. soft aluminum wire to the tin strips. However, they may be carved from balsa and cemented to the struts if more convenient. The other details were carved from balsa and cemented to the wing, being reinforced by steel straight pins with the heads removed, to fix them into position.

The fuselage is started by cutting the two lower side panels from ⅛ in. medium sheet balsa and attaching them, in an inverted position, over the top view of the fuselage plan on the flat working surface. Next, cement the lower halves of former No.'s 4 and 5 into place and allow to dry sufficiently. When they are dry, continue working aft, cementing lower halves of former No.'s 6 through 11, checking for proper alinement as you progress. All formers are of 3/32 in. sheet balsa with the exception of No.'s 1, 2, 4-A and 12. Former No.'s 1 and 12 are ⅛ in. balsa and

No.'s 2 and 4-A are 3/32 in. plywood. The two plywood formers are slotted for installation of engine bearers; however, these formers cannot be installed until after the inverted assembly has been removed from the working surface. This is the next step.

When the assembly has dried, remove it from the working surface and install firewall No. 2 and former No.'s 4-A and 12. Next, cement upper halves of former No.'s 6 through 11 into place and insert backbone piece, which extends from No. 2-A to No. 10, into slots at the top of each former. Former No.'s 2-A and 6-A are installed next, inserting waxed paper between No.'s 2 and 2-A and No.'s 6 and 6-A. Also insert waxed paper along lower edge on each side where joint of removable section of fuselage will be, making this section easier to remove when necessary. Now install remaining upper halves of former No.'s 3, 4 and 5. Note that the lower half of former No. 3 has been left out until fuel tank has been installed. Moving back to the tail of the fuselage, we now cement into place the ⅛ in. sq. balsa mounting strips for the horizontal stabilizer. These strips extend between No.'s 10 and 12 as shown on plan.

The horizontal stabilizer and elevators are cut from ¼ in. medium sheet balsa and are sanded into shape. It is suggested that the center portion of the stab be left unshaped and flat for easier mounting. Assemble stabilizer, elevators, horn and pushrod before mounting on fuselage. When this assembly is completed, it is then slipped into place, cemented, alined and allowed to dry. It may be noted that the upper edge of the lower side panels are on the thrust line and may be used in checking the incidence angles of the wing and horizontal tail surfaces.

The vertical fin is built up around a ⅛ in. sheet balsa frame or core. Cut out as shown on the plan side view and cement along center line of horizontal stab and back side of former No. 10. Next, cement tapering pieces of ⅛ in. sheet balsa to each side of rear edge of fin to form fin spar as shown in cross-section No. 12. Finish frame structure by adding to each side rectangular pieces of 1/16 in. sheet balsa of sufficient size to permit sanding ribs to shape. Sand leading edge of core at the same time. Note that lowest rib is double thickness where 1/16 fin covering meets 3/32 side planking. Portion of former No. 11 that is above the horizontal stab is also installed at this time.

When the vertical fin structure has been completed, planking of the upper half of the fuselage may be started. Using ¼ x 3/32 in. strips of medium or soft balsa, lay on planking from the thrust line up to the reference line shown at the tail of the plan side view. The remaining planking up to the backbone extends to former No. 9 only. Area from No. 9 to No. 11 is filled with soft balsa blocks on each side of the backbone. The remainder of the vertical fin is then covered with 1/16 in. sheet balsa. This covering may be held firmly into place while drying by using strips of masking or adhesive tape to strap around the LE and TE. Tip of fin is capped with ¼ in. balsa on each side.

The rudder is ⅜ in. thick at the heaviest point and may be made from balsa sheet when the heavier engines are used or laminated, as shown, when the Cameron .19 is used. For the laminated type, use ⅛ in. sheet balsa and cut out center as shown. Sand rudder to a thin TE. Then the two ⅛ sheet balsa laminations are cut out and cemented to each side of this hollow core. When cement has dried, sand rudder assembly to final shape and cement into place on vertical fin after balsa tail block has been installed.

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Construction of the cowling sections is next: the engine cowling and the accessory cowling. After the engine bearers have been installed, laminations of thicknesses shown on plan are cut to the shape of former No. 2 with engine bearer slots cut out the same as former No. 2. These are stacked on the engine bearers and tack-cemented together. The last lamination forward is of ⅛ in. balsa and is perfectly round as shown in cross-section No. 1. The reason for this construction is to allow ample balsa thickness for carving exhaust troughs and air scoop details. While this may be accomplished by using a solid balsa block, the writer found the hollowing-out process much easier by employing this lamination method. Also, the sheet balsa is easier to obtain than the block material. To continue with this type of construction, carve and sand to shape and finish out the details. Now remove the externally finished accessory section by sliding forward from engine bearers. Pop tack-cemented laminations apart, with the exception of lamination No. 1; cut out the center of each, leaving approximately ⅜ in. wall thickness. Leave No. 1 solid except for engine bearer slots. When reassembled, this will automatically aline cowl section. Alinement at the rear of this cowl section is maintained by a ⅛ in. balsa ring cemented to former No. 2 which fits snugly into the inside contour of the cowl at this point. However, since this section is rarely removed, it may be cemented into place for much easier installation. Next, cement alinement ring for engine cowling section to the forward face of former No. 1.

Start engine cowling by spotting holes for mounting of engine. Then make the two engine cowl mounting brackets from tin, using the template shown on the plans. Slip these brackets over the forward ends of engine bearers and spot holes in the engine mounting holes. Secure them in place with machine screws and nuts. Next, cut the 3/32 in. plywood cowl mounting ring and the balsa rings required to build up the speed ring. Sand speed ring to shape and mount to brackets previously installed on forward ends of engine bearers by means of two screws as shown. Provisions should be made to safety-lock these to prevent them from loosening and letting cowl fall into propeller. The writer chose drilled Fillister head screws, such as used in radios, with a semi-circular piano wire safety clip to fit in and between the heads of the two screws. Between the speed ring and the front face of the accessory cowl, fill in ¼ in. balsa strips. These will have to be beveled a little as they are installed around the circumference of the cowl. When these strips are installed, they are cut to length for snug fit, resting against the alinement ring on No. 1 and cemented firmly on the forward end only. Leave the front end of each strip about

1/16 in. high to allow for sanding. To insure proper alinement, install a strip at top, bottom and one on each side; then fill in between. Complete by sanding to shape and cutting openings for engine cylinder, exhaust stack and needle valve.

The next step is to manufacture and install the fuel tank. The rigid feed tube should be long enough to extend through the accessory cowl section for ease in replacing plastic feed tubing. After tank has been installed, cement wing assembly and lower half of former No. 3 into place. Bottom of fuselage is finished by planking between station No. 2 and the forward wing spar with ⅛ x 3/32 in. strips and the remaining with 3/32 in. sheet balsa, installing tail wheel and hook assembly before covering bottom from station No.'s 6 to 11. From No.'s 11 to 12 on bottom, fill with ¼ in. sheet balsa to allow for sanding of curved contour.

The tail wheel and hook assembly is built up on a piece of formed 1/16 in. piano wire and attached to a 3/32 in. plywood platform. The wire assembly is attached to the plywood by means of screws or by stitching with soft copper wire. Refer to plan for making wire assembly. When assembly is completed, it is installed between former No.'s 10 and 11 and locked into place by using ⅛ in. sq. balsa in the corners as shown. A tail wheel well opening is cut into the 3/32 balsa sheet bottom, allowing it to be slipped into place around the tail wheel assembly.

The tail hook release and engine speed control are not shown since most modelers have their own preferred mechanisms. However, on the original models, the tail hook is springloaded to hang down at about a 60° angle and is locked in the up position by a piece of .020 in. piano wire which extends forward to the bellcrank. A 90° arm, soldered to the elevator control pushrod, pulls the hook release wire forward as elevators are controlled for down. The release is adjusted to drop the hook on the last ⅛ in. of downward travel of the elevators. To drop the hook in flight, the control handle is snapped full down and back to neutral, releasing the hook before the plane has had time to respond to the down control. A return spring on the release wire makes it easy to recock the hook in the up position.

The finish on the original models was Corsair blue Aero Gloss, using red, white and yellow Aero Gloss to stencil the markings. Most of the job was done in the conventional manner: sealing, sanding, then painting with several coats of colored dope, wet-sanding and rubbing with compound between coats, the only deviation being that talcum powder was mixed with some of the blue Aero Gloss for sanding sealer since the prepared sanding sealer was not available at the localities in which they were built. One was built in Alaska and the other aboard ship in the Pacific.

Contest Calendar

FEBRUARY

5—*Green Bay, Wis.:* Class AA 2nd Winter Jamboree for FFG, TLG, RC. Robert L. Cowles, Jr., C.D., 224 Oak Hill Dr., Green Bay, Wis.

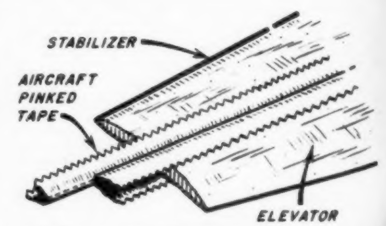
5—*Los Angeles, Calif.:* Inglewood Flightmasters' Monthly Trials for FFG, OHLG, Robert E. Moncrieff, C.D., 2108 Santa Fe Ave., Torrance, Calif.

19—*Phoenix, Ariz.:* Class AAA Southwestern Regional Model Airplane Contest for FFG, OR, TLG, OHLG, RC, CL, CLS, CLC, FFFS, CLFS, TR. Quentin T. Webster, C.D., 521 E. Camelback, Phoenix, Ariz.

26—*Inglewood, Calif.* Class AAA Skywolves' Combat Meet for CLC. Don C. Crystal, C.D., 805 E. Palmer Ave., Compton, Calif.

MARCH

18—*Haddonfield, N. J.* Class AA 4th Annual Polar Bear Meet for CL, beauty, TR, CLS, CLC. Reno Farinelli, C.D., 215 E. Orchard St., Hammonton, N. J.



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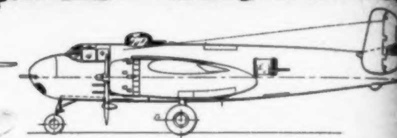

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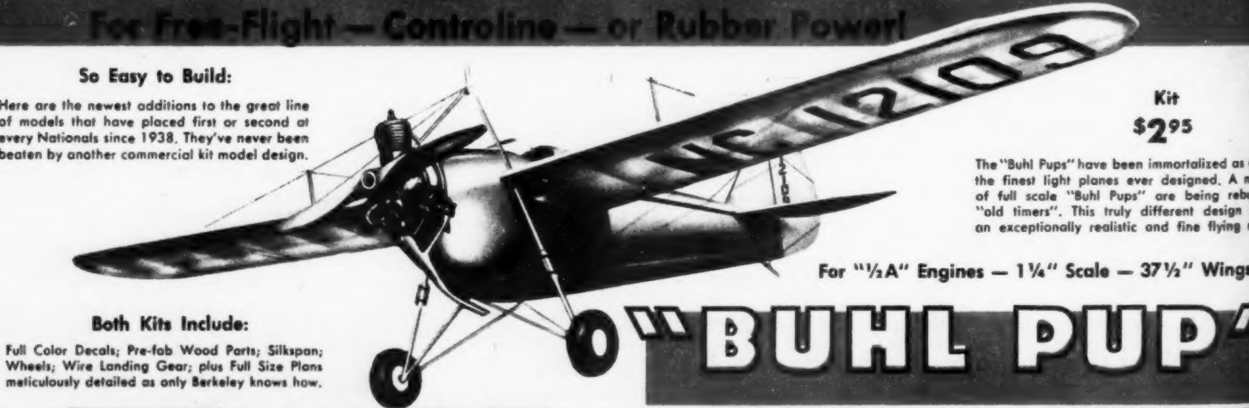

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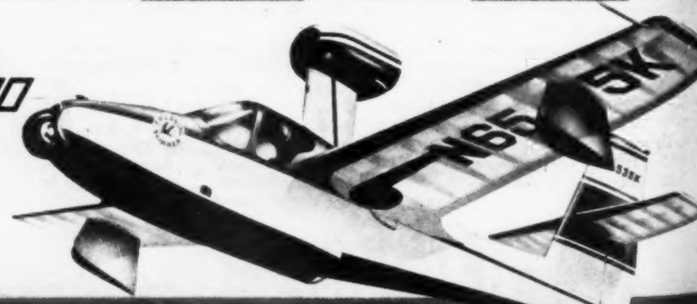

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